United States
Department of
Agriculture

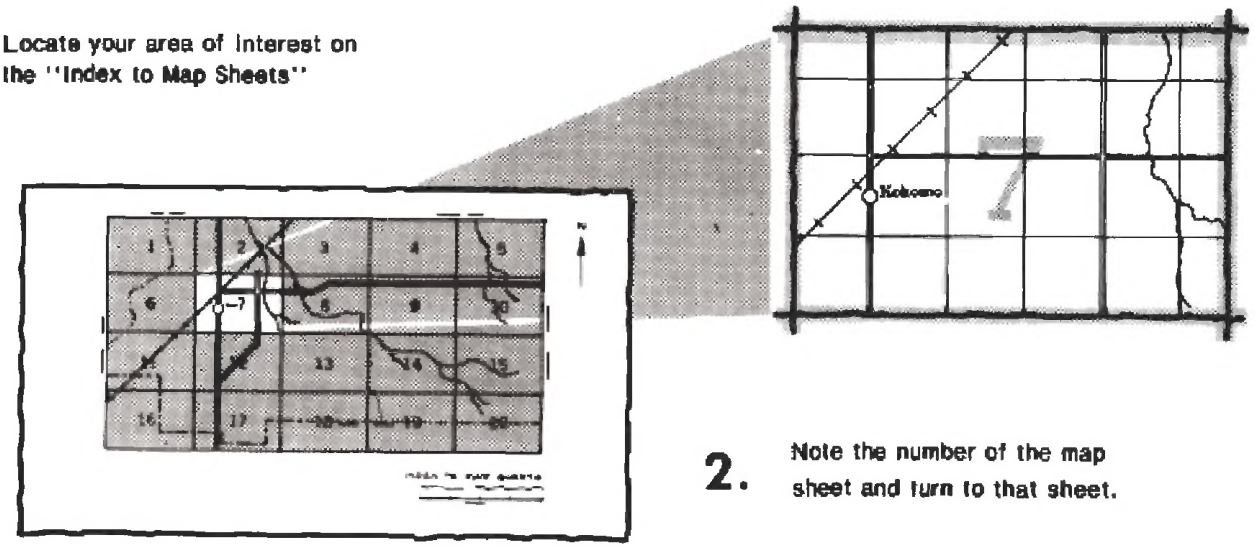
Soil
Conservation
Service

In Cooperation with
Arkansas Agricultural
Experiment Station

Soil Survey of Fulton and Izard Counties Arkansas

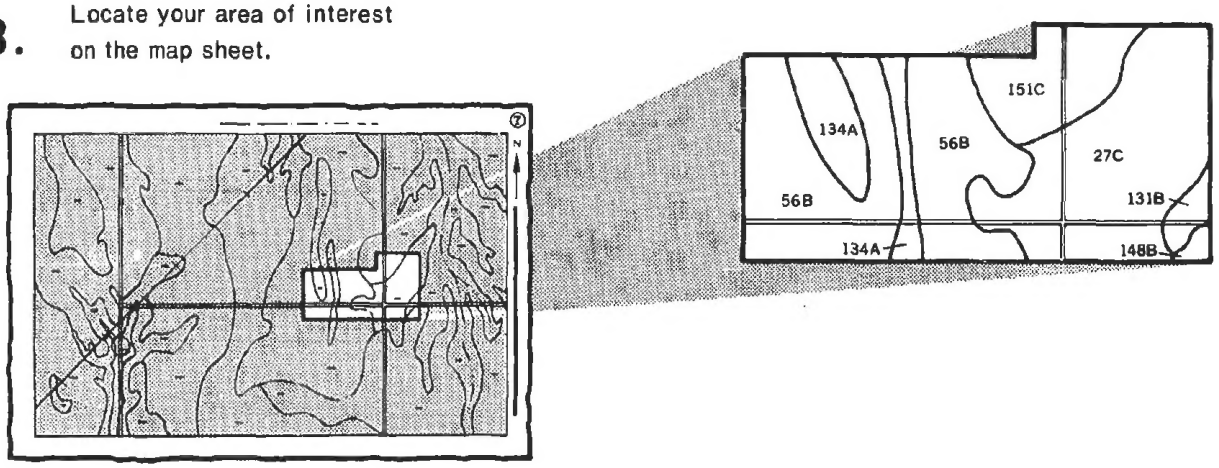
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

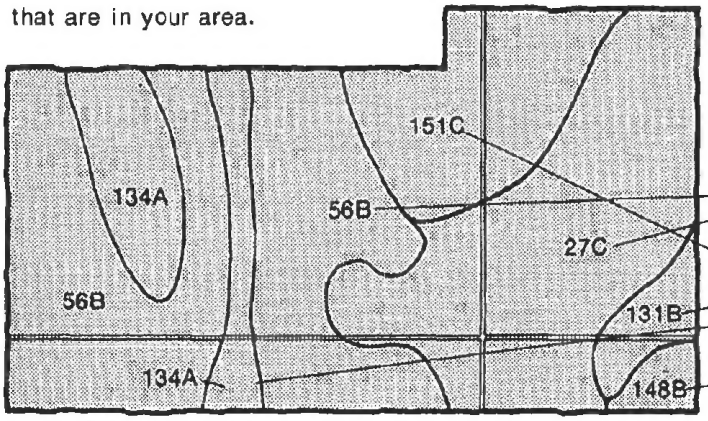


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area.

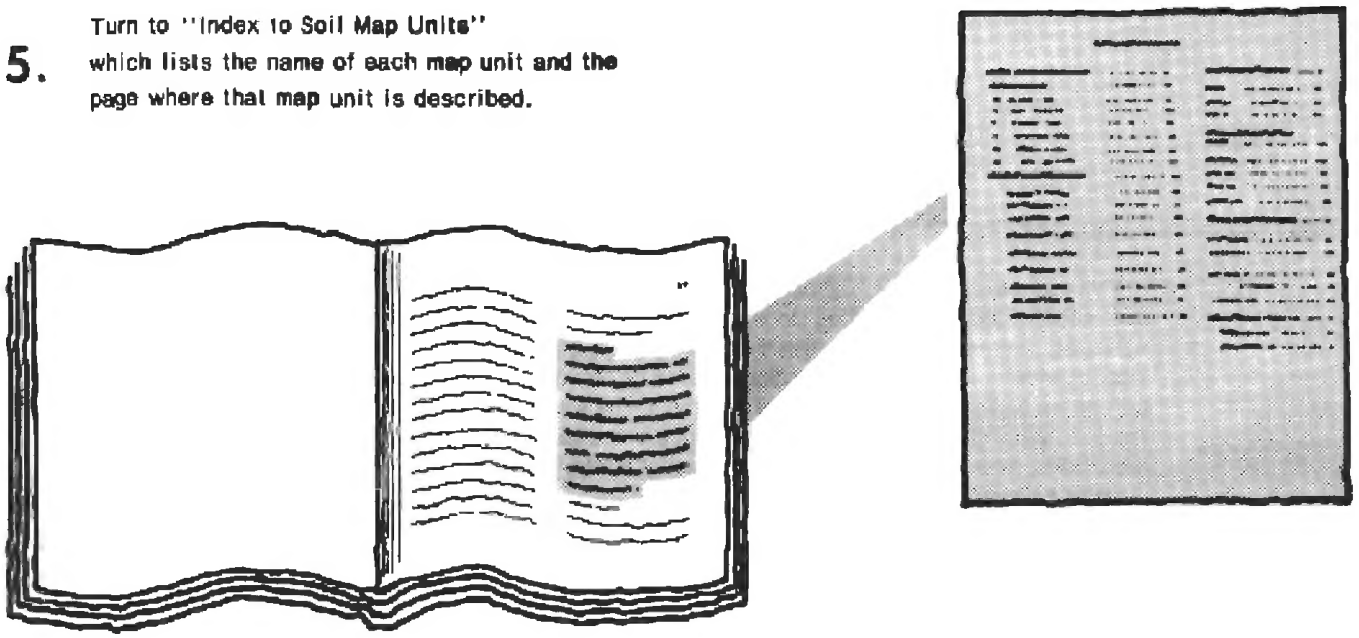


Symbols

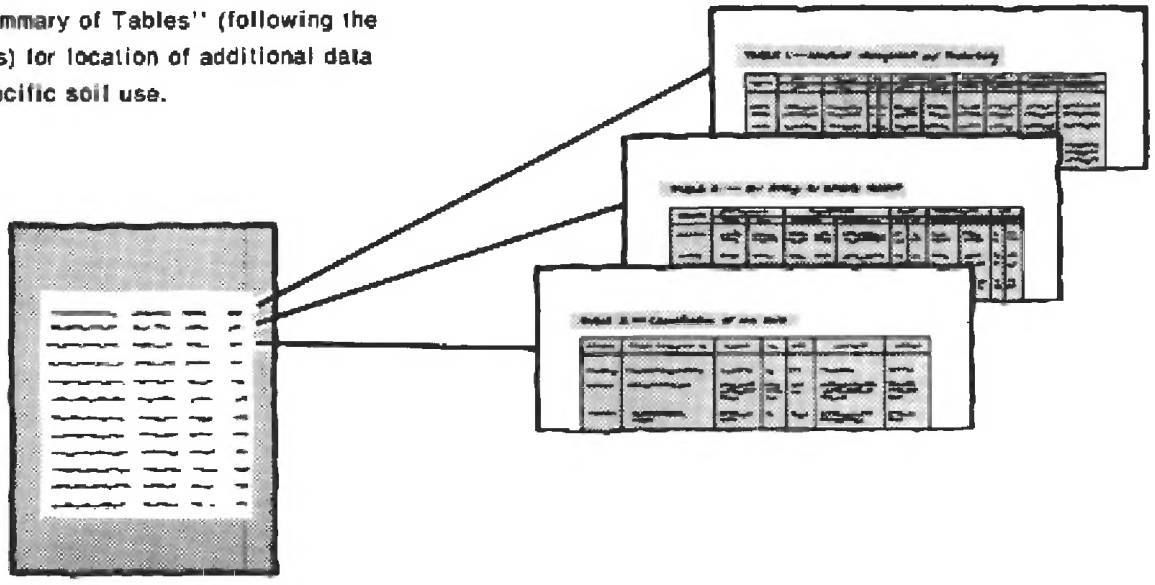
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1973-79. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Izard County Conservation District and the Fulton County Conservation District.

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soil series

Issued April 1984

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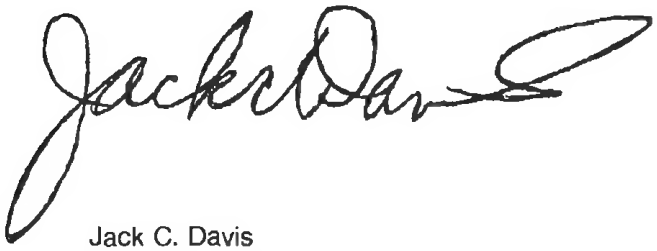
foreword

This soil survey contains information that can be used in land-planning programs in Fulton and Izard Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

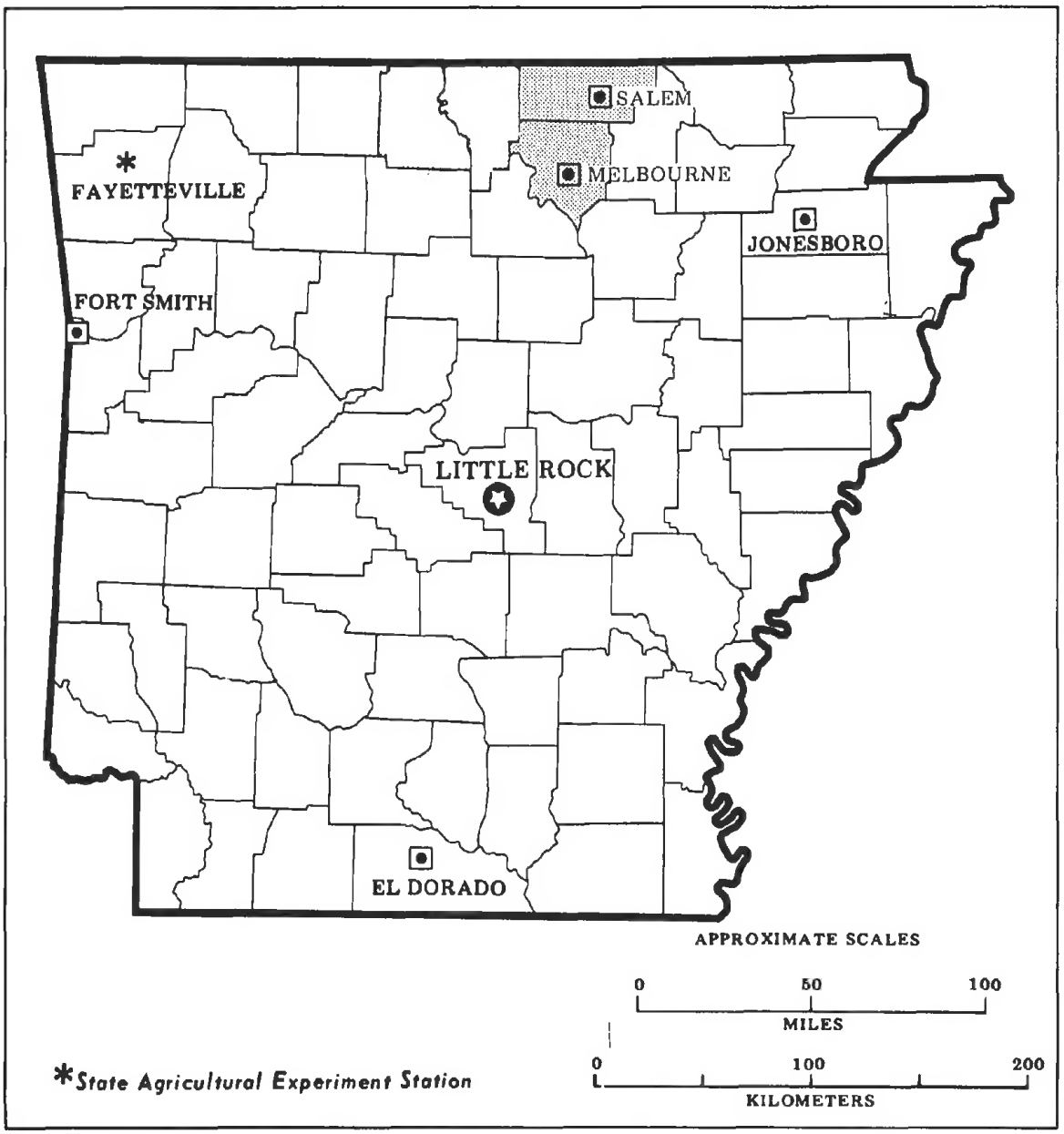
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Jack C. Davis
State Conservationist
Soil Conservation Service



Location of Fulton and Izard Counties in Arkansas.

soil survey of
Fulton and Izard Counties
Arkansas

By Larry B. Ward and James F. Rowlett
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Arkansas Agricultural Experiment Station

FULTON and IZARD COUNTIES are located in the north-central part of Arkansas.

Fulton County is rectangular. It is about 18 miles from north to south and, on the average, 38 miles from east to west. It is bordered on the north by the State of Missouri, on the west by Baxter County, on the south by Izard County, and on the east by Sharp County. The total area of the county is about 391,040 acres, or about 611 square miles. This includes 1,664 acres of large bodies of water. In 1970, the population was 7,699. Salem is the county seat and the main trade center. There are two smaller incorporated cities in the county.

Izard County is irregular in shape. It is about 22 miles from north to south and about 26 miles from east to west. It is bordered on the north by Fulton County, on the west by Stone and Baxter Counties, on the south by Stone and Independence Counties, and on the east by Sharp County. The total area of the county is about 369,280 acres, or about 577 square miles. This includes 2,240 acres of large bodies of water. In 1970, the population was 7,381. Melbourne is the county seat and the main trade center. There are five smaller incorporated cities in the county.

The economy of the two counties is based on livestock and poultry production, tourism, retirement income, timber production, small industry, and business.

general nature of the survey area

Uplands, where the soils formed in residuum of weathered sedimentary rocks that were deposited by marine waters, make up most of the survey area. The soils on nearly all of the gently sloping and moderately sloping uplands have been cleared and are used for pasture and hay crops. These areas are scattered throughout both counties.

Most soils on the uplands are low in natural fertility and in content of organic matter. They are generally poorly suited or not suited to cultivated crops, mainly because of slope, the hazard of erosion, surface stoniness, or shallowness to bedrock. Most soils on the uplands are well suited to poorly suited to use as pasture and moderately suited to poorly suited to use as woodland.

The soils in most of the steeper areas are in stands of hardwood trees. These soils are too steep, too stony, or too shallow to be intensively managed as meadow or pasture.

The acreage of harvested cropland in the survey area is very small. The cropland is mostly on flood plains and terraces and some is on gently sloping uplands. The main crops are hay, corn, small grains, and vegetables. Most soils on the flood plains in the survey area are poorly suited to cultivated crops because of the hazard of flooding. Most of these soils are used for improved pasture and hay crops.

In the paragraphs that follow, climate, farming, and physiography and drainage in Fulton and Izard Counties are described.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Summers are hot in Fulton and Izard Counties, especially at low elevations, and winters are moderately cool, especially in the mountains and high hills. Rainfall

is fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but snow cover lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Calico Rock, Arkansas, in the period 1964-77. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 39 degrees F, and the average daily minimum temperature is 26 degrees. The lowest temperature on record, which occurred at Calico Rock on January 12, 1977, is -15 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 91 degrees. The highest recorded temperature, which occurred on July 13, 1966, is 109 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 45 inches. Of this, 24 inches, or about 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 4.8 inches at Calico Rock on March 28, 1977. Thunderstorms occur on about 60 days each year, and most occur in summer.

Average seasonal snowfall is 5 inches. The greatest snow depth at any one time during the period of record was 12 inches. On an average of 2 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

farming

The first settlers in Fulton and Izard Counties were mostly subsistence farmers. They cleared and farmed small scattered tracts of land on flood plains and gently sloping uplands where the soils were deep and fairly clear of gravel or stones. As roads were built and markets developed, more of the upland soils were cleared, and cotton, corn, small grains, and livestock were produced for cash sale. The virgin hardwood timber was also cut and sold. This trend continued until about 1930. From 1930 through the 1950's, numerous farms were abandoned and the land use on many others changed from cultivated crops to pasture or meadow. At present, there is very little cultivated cropland in Fulton and Izard Counties. Nearly all of the cleared land is used for pasture and forage crops.

According to the 1974 Census of Agriculture, the number of farms in Fulton and Izard Counties has decreased. The size of farms has also decreased in Fulton County, while in Izard County the size has increased slightly. About 54 percent of Fulton County and about 49 percent of Izard County is farmland. The rest of the land is taken up by cities, towns, reservoirs, rural subdivisions, unimproved woodland, federally owned land, and transportation and utility facilities. Table 4 shows the number and size of farms in Fulton and Izard Counties in selected years.

Most farm income is from livestock, mainly beef cattle. The cattle industry consists mainly of cow-calf operations. Table 5 shows the number of livestock and poultry in selected years in Fulton County and in Izard County. Most calves are sold as weaners or, in their second year, as stockers. Most cattle produced in the survey area are sold to the midwestern feedlots. They are raised on cool- and warm-season pastures and mineral and protein supplements. Generally, grain feeds and hay are fed only in the winter. The production of pigs and hogs has fluctuated considerably but should continue to increase. There has been a substantial increase in the production of broilers in Izard County in recent years, and this trend should continue.

The sale of forest products is increasing in the survey area. Most woodland is on steep, stony, or shallow soils, which are poor sites for commercial timber production. Most privately owned woodland is in low-grade upland hardwoods or mixed stands of oaks and shortleaf pine. Most of the hardwood timber is sold locally as railroad ties, hardwood flooring, or handle, pallet, and furniture stock (fig. 1). Mill scraps are used to make charcoal. Much of the pine timber is treated with preservatives and sold for posts and wood fencing. A small amount is sawed into lumber at local mills. Some pine is sold locally as pulpwood and shipped to papermills in southern Arkansas. The shallow soils of Fulton and Izard Counties favor the growth of redcedar trees, which are used for posts, lumber, furniture, and novelties.

The major crops in the survey area are improved pasture and forage crops. The production of silage, corn, and other grain crops fluctuates depending on the number of livestock.

More than half of all resident owners of farms in Fulton and Izard Counties have jobs off the farm or are retired. Many retired people have moved into the two counties. Some of these people buy small acreages in rural areas and farm as a hobby.

physiography and drainage

Fulton and Izard Counties are in the Salem and Springfield Plateau sections of the Ozark Plateau Province. All of Fulton County and most of Izard County

Figure 1.—Most of the hardwood timber in the survey area is sold locally. These oak logs will be sawed into flooring and pallet stock.

lie within the Salem Plateau section. The extreme southern part of Izard County lies within the Springfield Plateau section.

The Salem Plateau is the northernmost and lowest in elevation of the three Plateaus of the Ozark Plateau Province. Elevation is about 700 to 1,000 feet above sea level. This area is characterized by gently sloping to rolling uplands, moderately steep to steep sideslopes. and outcrops of dolomite and sandstone. Arkana, Brockwell, Gepp, Doniphan, Agnos, Gassville, and Moko soils formed in this area.

The Springfield Plateau is adjacent to and higher in elevation than the Salem Plateau. It has been strongly dissected by streams. The dissected areas are characterized by steep V-shaped valleys that are separated by gently sloping to moderately sloping, very cherty or stony, long, narrow, winding ridges. The very cherty or stony sideslopes have a gradient of 12 to 50

percent; outcrops of limestone and sandstone are common. The elevation at the ridgetops is about 1,100 feet. There are a few broad upland flats that have a gradient of 1 to 8 percent. Noark, Moko, and Estate soils formed in this area.

Elevation in Fulton and Izard Counties ranges from a low of about 350 feet above sea level, where the White River leaves Izard County, to a high of 1,136 feet above sea level, a few miles west of Salem, in Fulton County.

Stream valleys are entrenched and are commonly less than one-fourth of a mile wide. Most flood plains in the survey area are 100 feet to 1,000 feet wide. Sturkie, Hontas, Melvin, Wideman, and Peridge soils formed in these areas.

There are three major streams: the White, Spring, and Strawberry Rivers. There are also numerous small intermittent and perennial streams in the two counties. The natural drainage system consists of many streams in a dendritic pattern in the upper reaches of several watersheds. Springs are common in some areas, where they contribute substantially to streamflow in summer and fall.

The western part of Fulton County is drained into Norfork Lake, a major multipurpose reservoir that was created on the Norfork River in 1949. Norfork Lake takes up about 800 acres in Fulton County. The major streams draining westward into Norfork Lake are Bushy Creek, Big Creek, Bennetts Bayou, Bennetts Creek, and Little Creek. The south-central part of Fulton County is drained by the Strawberry and Little Strawberry Rivers, which flow southward into Izard County. The north-central and eastern part of Fulton County is drained southward by the Spring River. The major streams that flow into the Spring River are the South Fork of the Spring River, Myatt Creek, English Creek, Field Creek, Big Creek, and Wild Horse Creek.

The southern and western parts of Izard County are drained by the White River. The major streams that flow into the White River are Piney Creek, Mill Creek, Wideman Creek, Twin Creek, Lyons Creek, Hidden Creek, Rocky Bayou, and Lafferty Creek. The northeastern part of Izard County is drained southeastward by the Strawberry River. The major streams that flow into the Strawberry River are the Little Strawberry River and the Piney Fork of the Strawberry River.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. In the descriptions that follow, the suitability of the soils in each map unit is given for *cultivated crops, pasture crops, woodland,* and *urban uses*. Cultivated crops are those grown extensively in the survey area. Pasture crops are those grown for livestock forage production. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

descriptions of the soils in Fulton County

1. Agnos-Gassville

Deep to moderately deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of siltstone and dolomite; on uplands

These soils are scattered throughout the central part of the county on uplands of the Salem Plateau.

This map unit makes up about 24 percent of the county. About 75 percent of the map unit is Agnos soils, 14 percent is Gassville soils, and 11 percent is minor soils.

Agnos soils are deep and gently sloping to moderately steep. They have a surface layer of very dark grayish brown very cherty silt loam and a subsurface layer of pale brown cherty silt loam. The subsoil is strong brown clay; strong brown mottled clay; yellowish brown mottled clay; and mottled yellowish brown, brownish yellow, light brownish gray, and light olive gray clay. The underlying material is soft, weathered siltstone.

Gassville soils are moderately deep to deep and gently sloping to moderately steep. They have a surface layer of very dark grayish brown very cherty silt loam, a subsurface layer of brown very cherty silt loam, and a subsoil of yellowish red and red cherty clay and mottled, strong brown and yellowish red clay. The underlying material is soft, weathered siltstone over hard, level-bedded dolomite bedrock.

The minor soils in this map unit are the very cherty Doniphan soils in positions similar to those of the major soils and the very cherty Arkana soils and the very stony Moko soils on ridges and side slopes at a slightly lower elevation. Also included are areas of Brockwell soils on broad uplands.

The soils in this map unit are mainly used as pasture and woodland. Most of the less sloping soils are cleared and are in pasture. The moderately steep soils are primarily in low-grade upland hardwood timber. Most areas were originally in hardwood forest interspersed with small areas of prairie vegetation.

Agnos and Gassville soils are poorly suited or not suited to cultivated crops. Slope, surface chert, and the hazard of erosion are the main limitations. These soils are moderately suited to use as pasture and woodland.

Agnos and Gassville soils are poorly suited to most urban uses. Low strength, permeability, the shrink-swell potential, and slope are the main limitations. Some of these limitations can be overcome by good design and engineering and construction techniques.

2. Arkana-Moko

Moderately deep and shallow, gently sloping to steep, well drained, very cherty and very stony soils that formed in residuum of dolomite and limestone; on uplands

These soils are mostly in the western part of the county on side slopes and ridge tops of the Salem Plateau.

This map unit makes up about 5 percent of the county. About 45 percent of the unit is Arkana soils, 30 percent is Moko soils, and 25 percent is soils of minor extent.

Arkana and Moko soils, in most places, are intermingled on the same landscape. Arkana soils are moderately deep. They have a surface layer of very dark grayish brown very cherty silt loam and a subsurface layer of dark brown and brown very cherty silt loam. The subsoil is yellowish red very cherty silty clay, yellowish red cherty clay, and dark yellowish brown clay. The underlying material is hard dolomite bedrock.

Moko soils are shallow. They consist of very dark brown and very dark grayish brown very stony clay loam about 10 inches thick overlying hard dolomite bedrock.

The minor soils in this map unit are the very cherty Agnos, Gassville, and Doniphan soils on hillsides and uplands at an elevation higher than that of the major soils. Also included are intermingled outcrops of bedrock.

The soils making up this map unit are, for the most part, in woodland of redcedar and lowgrade hardwoods. Some gently sloping and moderately sloping soils have been cleared and are used as pasture. Most areas were originally under an open stand of hardwoods and redcedar trees and prairie plants in the openings. Depth to bedrock, surface stones, the hazard of erosion, and slope are the main limitations of these soils for farming and most other uses.

Arkana soils are not suited to cultivated crops and poorly suited to use as improved pasture and woodland. Moko soils are not suited to cultivated crops or to use as improved pasture. They are poorly suited to use as woodland.

These soils are poorly suited to most urban uses. Depth to bedrock, surface stones, the high shrink-swell potential, low strength, and slope are severe limitations that are difficult and generally impractical to overcome on these soils.

3. Gassville-Doniphan

Moderately deep to deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of siltstone and dolomite; on uplands

These soils are scattered throughout the northwestern and central parts of Fulton County on uplands of the Salem Plateau.

This map unit makes up about 27 percent of the county. About 50 percent of the unit is Gassville soils, 13 percent is Doniphan soils, and 37 percent is soils of minor extent.

Gassville soils are moderately deep to deep and gently sloping to moderately steep. They have a surface layer of very dark grayish brown very cherty silt loam, a subsurface layer of brown very cherty silt loam, and a subsoil of yellowish red and red cherty clay and mottled strong brown and yellowish red clay. The underlying material is soft, weathered siltstone over hard dolomite bedrock.

Doniphan soils are deep and gently sloping. They have a surface layer of dark brown very cherty silt loam and a subsurface layer of light yellowish brown very cherty silt loam. The subsoil is strong brown very cherty silt loam; yellowish red mottled cherty silty clay; dark red mottled clay; and mottled dark red, strong brown, and light gray clay.

The minor soils in this map unit are the very cherty Agnos and Gepp soils in positions similar to those of the major soils, Captina soils on broad uplands, and the very cherty Arkana soils and the very stony Moko soils in lower positions.

The soils making up this map unit are mainly used as pasture and woodland. For the most part, the soils have been cleared and are used as pasture (fig. 2). Some of the moderately steep soils are in low-grade upland hardwood timber. Most of the soils were originally under hardwood forest and interspersed prairie vegetation.

Gassvile soils are poorly suited or not suited to cultivated crops. Doniphan soils are poorly suited to cultivated crops. Both soils are moderately suited to use as pasture and woodland.

Gassville soils are poorly suited to most urban uses, and Doniphan soils are moderately suited. The shrink-swell potential, low strength, permeability, and slope are the main limitations. Some of these limitations can be overcome by good design and engineering and construction techniques.

4. Gepp-Gassville

Deep to moderately deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of dolomite and of siltstone and dolomite; on uplands

These soils are mainly in the eastern part of the county on uplands of the Salem Plateau.

This map unit makes up about 23 percent of the county. About 85 percent of the map unit is Gepp soils, about 10 percent is Gassville soils, and about 5 percent is minor soils.

Gepp soils are deep and are gently sloping to moderately steep. They have a surface layer of brown very cherty silt loam and a subsoil of yellowish red cherty silty clay loam, red clay, red mottled cherty clay. Bedrock, directly below the subsoil, is cherty dolomite that has cracks and crevices filled with red clay.

Gassville soils are deep to moderately deep and are gently sloping to moderately steep. Their surface layer is very dark grayish brown very cherty silt loam, the subsurface layer is brown very cherty silt loam, and the subsoil is yellowish red and red cherty clay and mottled strong brown and yellowish red clay. The underlying material is soft, weathered siltstone over hard dolomite bedrock.

The minor soils in this map unit are the very cherty Agnos and Arkana soils and the very stony Moko soils.

The soils making up this unit are used mainly as pasture and woodland. The gently sloping soils, for the most part, have been cleared and are used as pasture (fig. 3). The moderately steep soils are primarily in low-grade upland hardwood timber. Most areas were originally in hardwood forest interspersed with small areas of prairie vegetation.

Gepp and Gassville soils are poorly suited or not suited to cultivated crops. Slope, the cherty surface, and

the hazard of erosion are the main limitations. Gepp and Gassville soils are moderately suited to use as pasture and woodland.

Gepp soils are poorly suited or moderately suited to most urban uses. Gassville soils are poorly suited to most urban uses. Low strength, permeability, the shrink-swell potential, and slope are the main limitations. Some of these limitations can be overcome by good design and engineering and construction techniques.

5. Brockwell

Deep, gently sloping to moderately steep, well drained, loamy soils that formed in residuum of sandstone; on uplands

This soil is mostly in the southwestern part of the county on uplands of the Salem Plateau.

This map unit makes up about 13 percent of the county. About 90 percent of the map unit is Brockwell soils, and 10 percent is minor soils.

Brockwell soils are gently sloping to moderately steep. They have a surface layer of grayish brown fine sandy loam or gravelly sandy loam and a subsurface layer of brown sandy loam or gravelly sandy loam. The subsoil is brown sandy loam or gravelly sandy loam; strong brown fine sandy loam or gravelly fine sandy loam; strong brown and pale brown, mottled fine sandy loam or gravelly fine sandy loam; and mottled, yellowish red, brown, and red sandy clay loam or gravelly sandy clay loam.

The minor soils in this map unit are the very cherty Agnos and Gassville soils.

This Brockwell soil is mainly used as pasture. Most areas were originally in mixed upland hardwoods. Slope and a severe hazard of erosion are the main limitations for farming and most other uses.

This soil is moderately suited to not suited to cultivated crops. It is well suited or moderately suited to use as pasture and moderately suited to use as woodland.

Figure 2.—This wooded area on Gassville and Doniphan soils has been prepared for aerial seeding of forage grasses by controlled burning of duff.

Figure 3.—Gently sloping soils in the Gepp-Gassville map unit are used mainly as pasture.

This soil is well suited or moderately suited to most urban uses. Slope is the main limitation.

6. Sturkie-Peridge-Secesh

Deep, level to gently sloping, well drained, loamy soils that formed in alluvium; on flood plains and terraces

These soils are on flood plains and terraces along the Spring River, South Fork of the Spring River, Myatt Creek, Big Creek, Bennetts Creek, and Bennetts Bayou.

This map unit makes up about 7 percent of the county. About 54 percent of the map unit is Sturkie soils, 20 percent is Peridge soils, 15 percent is Secesh soils, and about 11 percent is soils of minor extent.

Sturkie soils are on flood plains and are frequently flooded. They have a surface layer of very dark grayish brown silt loam and a subsoil of brown and dark brown silt loam. The underlying material is massive, dark brown silt loam and brown loam.

Secesh soils are on flood plains and are frequently flooded. They have a surface layer of dark brown silt loam and a subsoil of dark yellowish brown loam, strong brown cherty silty clay loam, yellowish red very cherty sandy clay loam, and strong brown very cherty sandy clay loam.

Peridge soils are on terraces. They have a surface layer of brown silt loam and a subsoil of yellowish red silt loam and silty clay loam; yellowish red, mottled silty clay loam; and red, mottled silty clay loam.

The minor soils in the map unit are the very cherty Elsah soils. Also included are gravel bars and areas of sandy and gravelly overwash.

The soils making up this map unit are mainly used for pasture and hay, but most of the soils were at some time under cultivation. Most areas were originally covered by a dense stand of mixed hardwood trees. Flooding and the hazard of erosion are the main limitations for farming and most other uses.

Sturkie soils are poorly suited to cultivated crops because of flooding. Secesh soils are not suited to cultivation because of flooding. Peridge soils are moderately suited to cultivated crops because of slope and the hazard of erosion. The soils of this unit are well suited to pasture and hay crops. Sturkie soils are well suited to use as woodland and Secesh and Peridge soils are moderately suited. Sturkie and Secesh soils have severe limitations for most urban uses because of flooding. Major flood control measures are needed to overcome this limitation. Peridge soils are moderately suited to most urban uses. Low strength and slope are the main limitations. These limitations generally can be overcome by good design and engineering and construction techniques.

7. Hontas-Peridge

Deep, level to gently sloping, moderately well drained and well drained, loamy soils that formed in alluvium; on flood plains and terraces

These soils are on flood plains and terraces, mainly along the Strawberry and Little Strawberry Rivers.

This map unit makes up about 1 percent of the county. About 52 percent of the map unit is Hontas soils, about 38 percent is Peridge soils, and 10 percent is soils of minor extent.

Hontas soils are on flood plains and are frequently flooded. They are moderately well drained. They have a surface layer of brown silt loam, a subsurface layer of dark yellowish brown silt loam, and a subsoil of yellowish brown and grayish brown, mottled silt loam. The underlying material is gray, mottled silty clay loam.

Peridge soils are on terraces and are well drained. They have a surface layer of brown silt loam and a subsoil of yellowish red silt loam and silty clay loam; yellowish red mottled silty clay loam; and red, mottled silty clay loam.

The minor soils in this map unit are the poorly drained Melvin soils on flood plains. Also included are gravel bars and areas of sandy and gravelly overwash.

The soils making up this map unit are now used mainly as pasture and for hay crops but have been at some time under cultivation. Most areas were originally in a dense stand of mixed hardwood trees.

Hontas soils are poorly suited to cultivated crops because of flooding. Peridge soils are moderately suited to cultivated crops. Hontas and Peridge soils are well suited to use as pasture and to hay crops. Hontas soils are well suited to use as woodland, and Peridge soils are moderately suited.

Hontas soils have severe limitations for most urban uses because of flooding. Major flood control measures are needed to overcome this limitation. Peridge soils are moderately suited to most urban uses. Low strength and slope are the main limitations. These limitations generally can be overcome by good design and engineering and construction techniques.

descriptions of the soils in Izard County

1. Agnos-Gassville

Deep to moderately deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of siltstone and dolomite; on uplands

These soils are in the northeastern and northwestern parts of the county on uplands of the Salem Plateau.

This map unit makes up about 10 percent of the county. About 52 percent of the map unit is Agnos soils, 24 percent is Gassville soils, and 24 percent is minor soils.

Agnos soils are deep and gently sloping to moderately steep. They have a surface layer of very dark grayish brown very cherty silt loam and a subsurface layer of pale brown cherty silt loam. The subsoil is strong brown clay; strong brown, mottled clay; yellowish brown, mottled clay; and mottled yellowish brown, brownish yellow, light brownish gray, and light olive gray clay. The underlying material is soft, weathered siltstone.

Gassville soils are moderately deep to deep soils on ridgetops and side slopes. They have a surface layer of very dark grayish brown very cherty silt loam, a subsurface layer of brown very cherty silt loam, and a subsoil of yellowish red and red cherty clay and mottled, strong brown and yellowish red clay. The underlying material is soft, weathered siltstone over hard, level-bedded dolomite bedrock.

The minor soils in this map unit are the very cherty Doniphan and Arkana soils, the Captina soils, and the very stony Moko soils.

The soils making up this map unit are mainly used as pasture and woodland. The less sloping soils, for the most part, have been cleared and are used as pasture. The moderately steep soils are primarily in low-grade upland hardwood timber. Most areas were originally in hardwood forest interspersed with prairie vegetation.

Agnos and Gassville soils are poorly suited or not suited to cultivated crops. Slope, the cherty surface, and the hazard of erosion are the main limitations. These soils are moderately suited to use as pasture and woodland.

Agnos and Gassville soils are poorly suited to most urban uses. Low strength, permeability, the shrink-swell potential, and slope are the main limitations. Some of these limitations can be overcome by good design and engineering and construction techniques.

2. Arkana-Moko

Moderately deep and shallow, gently sloping to steep, well drained, very cherty and very stony soils that formed in residuum of dolomite and limestone; on uplands

These soils are scattered throughout most of the county on side slopes and ridge tops of the Salem Plateau and side slopes of the Springfield Plateau.

This map unit makes up about 7 percent of the county. About 50 percent of the unit is Arkana soils, 30 percent is Moko soils, and 20 percent is soils of minor extent.

Arkana and Moko soils, in most places, are intermingled on the same landscape. Arkana soils are moderately deep. They have a surface layer of very dark grayish brown very cherty silt loam, a subsurface layer of dark brown and brown very cherty silt loam, and a subsoil of yellowish red very cherty silty clay, yellowish red cherty clay, and dark yellowish brown clay. The underlying material is hard limestone or dolomite bedrock.

Moko soils are shallow. They consist of very dark brown and very dark grayish brown very stony clay loam about 10 inches thick overlying hard limestone or dolomite bedrock.

The minor soils in this map unit are the very cherty Noark soils on hillsides at a higher elevation. Also included are intermingled outcrops of bedrock and areas of Estate and Portia soils, and small areas of Secesh and Elsah soils along drainageways.

The soils making up this map unit are mainly in woodland of redcedar and low-grade hardwoods. The gently sloping and moderately sloping soils in some areas have been cleared and are used as pasture. Most areas were originally in an open stand of hardwoods and redcedar trees and prairie plants in the openings. Depth to bedrock, surface stones, the hazard of erosion, and slope are the main limitations of these soils for farming and most other uses.

Arkana soils are not suited to cultivated crops and poorly suited to use as improved pasture and woodland. Moko soils are not suited to cultivated crops or to use as improved pasture. They are poorly suited to use as woodland.

Arkana and Moko soils are poorly suited to most urban uses. Shallowness to bedrock, surface stoniness, the high shrink-swell potential, low strength, and slope are severe limitations that are difficult and generally impractical to overcome on these soils.

3. Brockwell-Portia-Boden

Deep, gently sloping to moderately steep, well drained, loamy soils that formed in residuum of sandstone, residuum or colluvium that derived from interbedded sandstone and limestone, and residuum of sandstone and siltstone; on uplands

These soils are mostly in the northern two-thirds of the county on broad uplands of the Salem Plateau.

This map unit makes up about 46 percent of the county. About 70 percent of the map unit is Brockwell soils, 15 percent is Portia soils, 10 percent is Boden soils, and 5 percent is soils of minor extent.

Brockwell soils are gently sloping to moderately steep. They have a surface layer of grayish brown fine sandy loam or gravelly sandy loam and a subsurface layer of brown sandy loam or gravelly sandy loam. The subsoil is brown sandy loam or gravelly sandy loam; strong brown fine sandy loam or gravelly fine sandy loam; strong brown and pale brown, mottled fine sandy loam or gravelly fine sandy loam; and mottled, yellowish red, brown, and red sandy clay loam or gravelly sandy clay loam.

Portia soils are gently sloping to moderately sloping. They have a surface layer of brown sandy loam and a subsoil of dark brown, reddish brown, and yellowish red loam, red clay loam, and red clay.

Boden soils are gently sloping to moderately steep. They have a surface layer of dark grayish brown gravelly sandy loam, a subsurface layer of brown gravelly sandy loam, and a subsoil of yellowish red sandy clay loam; red sandy clay; and mottled, red, strong brown, and grayish brown clay. The underlying material is soft, weathered siltstone.

The minor soils in this map unit are the very cherty Agnos soils, the stony Ramsey soils, and, along drainageways, small areas of Wideman soils. Also included are outcrops of sandstone.

Most soils in this map unit are used as pasture. Most areas were originally in mixed upland hardwoods. Slope and a severe hazard of erosion are the main limitations for farming and most other uses.

The soils in this map unit are moderately suited to not suited to cultivated crops, depending on slope. These soils are well suited to moderately suited to use as pasture and moderately suited to use as woodland.

Brockwell soils are well suited to moderately suited to most urban uses, depending on slope. Portia soils are moderately suited to most urban uses. Low strength, permeability, and slope are the main limitations. Boden soils are moderately suited to poorly suited to most urban uses. Low strength, the slow permeability, and slope are the main limitations. Some of these limitations can be partly overcome by good design and engineering and construction techniques.

4. Estate-Portia-Moko

Deep and shallow, gently sloping to steep, well drained, stony and loamy soils that formed in residuum or colluvium of interbedded sandstone and limestone and residuum of limestone or dolomite; on uplands

These soils are scattered throughout most of the county on rolling to steep hillsides at lower elevations of the Springfield Plateau and on gently sloping to steep uplands of the Salem Plateau.

This map unit makes up about 15 percent of the county. It consists of about 35 percent Estate soils, 25 percent Portia soils, 20 percent Moko soils, and 20 percent soils of minor extent.

Estate soils are on side slopes at higher elevations. They have a surface layer of dark grayish brown stony sandy loam, a subsurface layer of yellowish brown stony sandy loam, and a subsoil of yellowish red sandy loam; yellowish red clay loam; red clay loam; and red, mottled

clay. Bedrock, directly below the subsoil, is hard, undulating limestone.

Portia soils are on foot slopes. They have a surface layer of brown sandy loam and a subsoil of dark brown, reddish brown, and yellowish red loam, red clay loam, and red clay.

Moko soils are on side slopes. They have a surface layer of very dark brown and very dark grayish brown very stony clay loam over hard limestone bedrock.

The minor soils in this map unit are the very cherty Noark soils on steep side slopes at higher elevations, the very cherty Arkana soils, and Wideman soils on flood plains along streams. Also included are outcrops and escarpments of sandstone and limestone.

The soils making up this unit are in pasture and woodland. Portia soils, for the most part, have been cleared and are used as pasture. The stony Estate and Moko soils are in mixed hardwoods and redcedars. Slope, stoniness, outcrops of rock, and a severe hazard of erosion are the main limitations of these soils for farming and most other uses.

Estate and Moko soils are not suited to cultivated crops. Portia soils range from moderately suited to not suited to cultivated crops, depending on slope. Estate soils are poorly suited and Moko soils are not suited to use as improved pasture. Portia soils are well suited to use as pasture. Estate and Portia soils are moderately suited and Moko soils are poorly suited to use as woodland.

Estate and Moko soils are poorly suited to most urban uses because of slope, low strength, the slow permeability, depth to bedrock, and surface stones. These limitations are difficult and in most places impractical to overcome. Portia soils are moderately suited or poorly suited to most urban uses. Slope and low strength are the main limitations. These limitations can be partly overcome with good design and engineering and construction techniques.

5. Noark-Arkana-Moko

Deep, moderately deep and shallow, gently sloping to steep, well drained, very cherty and very stony soils that formed in residuum of cherty limestone; on uplands

These soils are in the southern part of the county on hillsides and ridgetops of the highly dissected Springfield Plateau.

This map unit makes up about 16 percent of the county. About 45 percent of the map unit is Noark soils, 18 percent is Arkana soils, 10 percent is Moko soils, and 27 percent is soils of minor extent.

Noark soils are deep and very cherty throughout. They are on hillsides and ridgetops. They have a surface layer of dark grayish brown very cherty silt loam, a subsurface layer of brown very cherty silt loam, and a subsoil of yellowish red very cherty silt loam and red very cherty silty clay.

Arkana soils are moderately deep and very cherty. They are on side slopes. They have a surface layer of very dark grayish brown and dark brown very cherty silt loam, a subsurface layer of brown very cherty silt loam, and a subsoil of yellowish red very cherty silty clay, yellowish red cherty clay, and dark yellowish brown clay. Bedrock, directly below the subsoil, is hard, level-bedded limestone.

Moko soils are shallow and very stony. They are on side slopes. They have a surface layer of very dark brown and very dark grayish brown very stony clay loam about 10 inches thick over hard, level-bedded limestone bedrock.

The minor soils in this map unit are Estate and Portia soils at slightly lower elevations and Ramsey soils near sandstone outcrops. Also included are outcrops of sandstone and limestone.

The gently sloping to moderately steep Noark soils are mainly used as pasture. Most areas of Arkana and Moko soils are in woodland of mixed hardwoods and redcedars. Most areas were originally in mixed hardwoods, pines, and redcedar trees. Slope, depth to bedrock, surface stoniness, and a high content of chert fragments are the main limitations of these soils for farming and most other uses.

Noark soils are moderately suited or not suited to cultivated crops, depending on slope. Arkana and Moko soils are not suited to cultivated crops because of surface chert and stones, depth to bedrock, and slope.

Noark soils are moderately suited or not suited to use as pasture, depending on slope. Arkana soils are poorly suited or not suited to use as pasture, and Moko soils are not suited to use as improved pasture.

Noark soils are moderately suited to use as woodland, and Arkana and Moko soils are poorly suited.

Noark soils are moderately suited or poorly suited to most urban uses. Slope is the main limitation. This limitation is difficult and in most places impractical to overcome. Arkana and Moko soils are poorly suited to most urban uses. Depth to bedrock, surface stoniness, and permeability are the main limitations. These limitations are difficult and in most places impractical to overcome.

6. Sturkie-Peridge

Deep, nearly level to gently sloping, well drained, loamy soils that formed in alluvium; on flood plains and terraces

These soils are on flood plains and terraces along the White River.

This map unit makes up about 2 percent of the county. About 65 percent of the map unit is Sturkie soils, 30 percent is Peridge soils, and 5 percent is soils of minor extent.

Sturkie soils are on flood plains and are occasionally flooded. In some areas, these soils are protected from flooding by upstream flood-retarding structures, but the protection decreases from west to east along the river.

Sturkie soils have a surface layer of very dark grayish brown silt loam and a subsoil of brown and dark brown silt loam. The underlying material is massive, dark brown and brown silt loam.

Peridge soils are on stream terraces. They have a surface layer of brown silt loam and a subsoil of yellowish red silt loam and silty clay loam; yellowish red, mottled silty clay loam; and red, mottled silty clay loam.

The minor soils in this map unit are the very cherty Elsah soils and Secesh soils on small tributaries. Also included are gravel bars and areas of sandy overwash.

The soils making up this unit are mainly used for pasture and hay but have a history of 60 to 90 years of cultivation. Most areas were originally in a dense stand of mixed hardwood trees. Flooding and the hazard of erosion are the main limitations of these soils for farming and for most other uses.

Sturkie soils are well suited to cultivated crops and to use as pasture and woodland. Occasional flooding is the only limitation. Peridge soils are moderately suited to cultivated crops. Slope and the hazard of erosion are the main limitations. Peridge soils are well suited to use as pasture and moderately suited to use as woodland.

Sturkie soils have severe limitations for urban uses because flooding is a hazard. Peridge soils are moderately suited to most urban uses. Low strength and slope are the main limitations. These generally can be overcome by good design and engineering and construction techniques.

7. Hontas-Peridge-Wideman

Deep, level to gently sloping, moderately well drained, well drained, and excessively drained, loamy and sandy soils that formed in alluvium; on flood plains, terraces, and natural levees

These soils are on flood plains, terraces, and natural levees along the Strawberry River, the Little Strawberry River, and Piney, Mill, Wideman, and Lyons Creeks.

This map unit makes up about 4 percent of the county. About 40 percent of the map unit is Hontas soils, about 25 percent is Peridge soils, 25 percent is Wideman soils, and 10 percent is soils of minor extent.

Hontas soils are on flood plains and are frequently flooded. They are moderately well drained. They have a surface layer of brown silt loam, a subsurface layer of dark yellowish brown silt loam, and a subsoil of yellowish brown and grayish brown, mottled silt loam. The underlying material is gray, mottled silty clay loam.

Peridge soils are well drained and are on terraces. They have a surface layer of brown silt loam and a subsoil of yellowish red silt loam and silty clay loam; yellowish red, mottled silty clay loam; and red, mottled silty clay loam.

Wideman soils are excessively drained and are on flood plains and natural levees. They have a surface layer of dark brown fine sand and a subsurface layer of yellowish brown fine sand. The underlying material is dark yellowish brown loamy fine sand, light yellowish brown fine sand, brown fine sandy loam, very pale brown fine sand, dark grayish brown fine sandy loam, very pale brown fine sand, dark grayish brown loamy fine sand, and yellowish brown fine sandy loam.

The minor soils in this map unit are the poorly drained Melvin soils. Also included are gravel bars and areas of sandy or gravelly overwash.

Most soils in this map unit are used for pasture and hay but have a history of 60 to 90 years of cultivation. Most areas were originally in a dense stand of mixed hardwood trees. Flooding and the hazard of erosion are the main limitations of these soils for farming and for most other uses.

Because of flooding, Hontas soils are poorly suited and Wideman soils are not suited to cultivated crops. Peridge soils are only moderately suited to cultivated crops because of slope and the hazard of erosion. Hontas and Peridge soils are well suited to use as pasture, and Wideman soils are moderately suited. Hontas soils are well suited to use as woodland, and Peridge and Wideman soils are moderately suited.

Hontas and Wideman soils have severe limitations for urban uses because of flooding. Major flood control measures are needed to overcome this limitation. Peridge soils are moderately suited to urban uses. Low strength, slope, and permeability are the main limitations. These limitations generally can be overcome by good design and engineering and construction techniques.

broad land use considerations

The soils in Fulton and Izard Counties vary widely in their suitability for agricultural and urban uses. In the following pages the soils making up the general soil map units are rated for cultivated crops, pasture, woodland, and urban uses.

The ratings reflect the cost of measures needed to overcome limitations and problems that occur after the measures have been taken. They also point out limitations that are difficult and in places impractical to overcome. The ratings do not consider location in relation to existing transportation systems or to other facilities.

The ratings for cultivated crops indicate suitability of the soils for row crops, home gardens, orchards, lawns, and flowers and shrubs. Pasture is land in such domestic grasses as tall fescue or improved bermudagrass; woodland is land that supports a stand of trees. The ratings for pasture and woodland indicate potential productivity of the soils and the cost of establishing and maintaining grass or trees. Urban uses include residential, commercial, and industrial sites, roads and streets, and sanitary facilities.

The soils in Fulton County are moderately suited to not suited to cultivated crops. Soils in the Sturkie-

Peridge-Secesh and Hontas-Peridge map units are moderately suited or poorly suited. Soils in the Brockwell map unit are moderately suited to not suited. Soils in the Agnos-Gassville, Gassville-Doniphan, and Gepp-Gassville map units are generally poorly suited or not suited to cultivated crops, and those in the Arkana-Moko map unit are not suited. The main limitations are slope, coarse fragments, the hazard of erosion, surface stones, depth to bedrock, and the hazard of flooding.

The soils in Izard County are well suited to not suited to cultivated crops. Soils in the Sturkie-Peridge map unit are well suited or moderately suited. Soils in the Hontas-Peridge-Wideman unit are moderately suited or poorly suited. Soils in the Brockwell-Portia-Boden and Estate-Portia-Moko map units are moderately suited to not suited. Soils in the Agnos-Gassville and Noark-Arkana-Moko map units are poorly suited or not suited to cultivated crops, and those in the Arkana-Moko map unit are generally not suited. The main limitations are slope, the hazard of erosion, surface stones, depth to bedrock, coarse fragments, and the hazard of flooding.

The soils in Fulton County are well suited to not suited to use as pasture. Soils in the Brockwell, Sturkie-Peridge-Secesh, and Hontas-Peridge map units are well suited to use as pasture, and those in the Agnos-Gassville, Gassville-Doniphan, and Gepp-Gassville units are moderately suited. Soils in the Arkana-Moko map unit are poorly suited or not suited to use as improved pasture.

In Izard County, the soils in the Brockwell-Portia-Boden and Sturkie-Peridge map units are well suited to use as improved pasture. Soils in the Hontas-Peridge-Wideman map unit are well suited to moderately suited. Soils in the Estate-Portia-Moko and Noark-Arkana-Moko map units are well suited to not suited. Soils in the Agnos-Gassville unit are moderately suited, and those in the Arkana-Moko unit are poorly suited or not suited to use as improved pasture.

The soils in Fulton County are well suited to poorly suited to use as woodland. Soils in the Sturkie-Peridge-Secesh and Hontas-Peridge map units are well suited or moderately suited, and those in the Agnos-Gassville, Brockwell, Gassville-Doniphan, and Gepp-Gassville map units are moderately suited. Soils in the Arkana-Moko map unit are generally poorly suited to use as woodland.

In Izard County, soils in the Hontas-Peridge-Wideman and Sturkie-Peridge map units are well suited or moderately suited to use as woodland. Soils in the Agnos-Gassville and Brockwell-Portia-Boden map units are moderately suited, and soils in the Noark-Arkana-Moko and Estate-Portia-Moko units are moderately suited or poorly suited. Soils in the Arkana-Moko map unit are poorly suited to use as woodland.

The soils in the survey area are well suited to poorly suited to urban uses. In Fulton County, soils in the Brockwell map unit are well suited or moderately suited to urban uses. Soils in the Gassville-Doniphan, Gepp-Gassville, Sturkie-Peridge-Secesh, and Hontas-Peridge map units are moderately suited or poorly suited. Soils in the Agnos-Gassville and Arkana-Moko map units are poorly suited to urban uses.

In Izard County, soils in the Brockwell-Portia-Boden map unit are well suited to poorly suited to urban uses. Soils in the Estate-Portia-Moko, Sturkie-Peridge, Hontas-Peridge-Wideman, and Noark-Arkana-Moko map units are moderately suited or poorly suited to urban uses, and soils in the Agnos-Gassville and Arkana-Moko map units are poorly suited.

The main limitations of the soils for urban uses are slope, permeability, low strength, the hazard of flooding, the shrink-swell potential, depth to bedrock, and surface stones. Some of these limitations can be overcome by good design and by engineering and construction techniques. Others are difficult and generally impractical to overcome.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Noark very cherty silt loam, 3 to 8 percent slopes, is one of several phases in the Noark series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Arkana-Moko complex, 8 to 20 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Estate-Portia-Moko association, rolling, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Secesh and Elsah soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 6 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

1—Agnos very cherty silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on ridges. Slopes are smooth and convex. Individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam to a depth of about 2 inches. The subsurface layer is pale brown cherty silt loam to a depth of about 10 inches. The subsoil is strong brown clay to a depth of about 19 inches; strong brown, mottled clay to a depth of about 34 inches; yellowish brown, mottled clay to a depth of about 42 inches; and mottled, brownish yellow, light brownish gray, light olive gray, and yellowish brown clay to a depth of about 57 inches. The underlying material is soft, weathered siltstone to a depth of about 72 inches over hard siltstone or dolomite bedrock.

Agnos soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface and subsurface layers and is strongly acid to extremely acid in the subsoil. Permeability is very slow, and the available water capacity is medium. The cherty surface limits the use of some farm equipment. The clayey subsoil restricts root penetration. Runoff is medium to rapid, and erosion is a severe hazard.

Included with this soil in mapping are small areas of Arkana, Moko, Gassville, and Doniphan soils on uplands and small areas of Elsah and Secesh soils on narrow flood plains. Also included are small areas of sandy soils that have sandstone gravel and cobbles on the surface.

This soil is poorly suited to cultivated crops. Suitable crops include small grains. Under management that includes minimum tillage, contour cultivation, and terracing, sown crops that leave large amounts of residue can be grown occasionally in a cropping system that includes close-growing cover most of the time.

This soil is mainly used as woodland or pasture. It is moderately suited to use as pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lovegrass.

Agnos soils are moderately suited to use as woodland. Suitable trees include shortleaf pine and loblolly pine. There are no significant limitations to woodland use or management.

This soil is poorly suited to most urban uses. The shrink-swell potential is a moderate limitation for dwellings. The shrink-swell potential and slope are moderate limitations for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by proper design and good engineering techniques. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation is difficult and in most places impractical to overcome.

This soil is in capability unit IVe-2 and in woodland suitability group 4o1.

2—Agnos very cherty silt loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on hillsides. Slopes are uneven and convex. Individual areas range from about 20 to 300 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam to a depth of about 2 inches. The subsurface layer is pale brown cherty silt loam to a depth of about 10 inches. The subsoil is strong brown clay to a depth of about 19 inches; strong brown, mottled clay to a depth of about 34 inches; yellowish brown, mottled clay to a depth of about 42 inches; and mottled, brownish yellow, light brownish gray, light olive gray, and yellowish brown clay to a depth of about 57 inches. The underlying material is soft, weathered siltstone to a depth of about 72 inches over hard siltstone or dolomite bedrock.

Agnos soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface and subsurface layers and is strongly acid to extremely acid in the subsoil. Permeability is very slow, and the available water capacity is medium. The cherty surface and slope limit the use of farm equipment. The clayey subsoil restricts root penetration. Runoff is rapid, and erosion is a severe hazard.

Included with this soil in mapping are small areas of Arkana, Moko, Gassville, and Doniphan soils on uplands and Elsah and Secesh soils on narrow flood plains. Also included are small areas of sandy soils that have sandstone gravel and cobbles on the surface.

This soil is not suited to cultivated crops because of slope, surface chert, and a severe hazard of erosion.

This soil is used mainly for low-grade upland hardwoods or is used as pasture. It is moderately suited to use as pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lovegrass.

Agnos soils are moderately suited to use as woodland. Suitable trees include shortleaf and loblolly pines. There are no significant limitations to woodland use or management.

This soil is poorly suited to most urban uses. The shrink-swell potential and slope are moderate limitations for dwellings. Slope is a severe limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by proper design and good engineering and construction techniques. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation is difficult and in most places impractical to overcome.

This soil is in capability unit VIe-2 and in woodland suitability unit 4o1.

3—Arkana-Moko complex, 3 to 8 percent. This complex consists of Arkana and Moko soils on upland ridges in areas that are so small and intermingled that it was not practical to map them separately. The areas are about 10 to 200 acres in size. The individual areas of each soil are about 1 acre to 5 acres in size. Slopes are uneven and convex.

Arkana soils make up about 60 percent of each mapped area. Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is dark brown and brown very cherty silt loam to a depth of about 10 inches. The subsoil is yellowish red very cherty silty clay to a depth of about 16 inches; yellowish red cherty clay to a depth of about 21 inches; and dark yellowish brown clay to a depth of about 28 inches. The underlying material is hard, level-bedded dolomite bedrock.

Arkana soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from medium acid to mildly alkaline in the surface and subsurface layers and strongly acid to moderately alkaline in the

subsoil. Permeability is very slow, and the available water capacity is low. The rooting zone is moderately deep and can be penetrated by roots down to the clayey subsoil, which somewhat restricts further penetration.

Moko soils make up about 35 percent of each mapped area. Typically, the soil is very dark brown and very dark grayish brown very stony clay loam about 10 inches thick over hard dolomite bedrock.

Moko soils are moderate in natural fertility and moderate to high in content of organic matter. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

The remaining 5 percent of this map unit consists of outcrops of bedrock, small areas of Agnos, Doniphan, and Gassville soils, and areas of soils that are similar to Arkana soils except that they are deeper than 40 inches to bedrock. Also included are small areas of Elsah and Secesh soils on narrow flood plains.

The soils making up this complex are not suited to cultivated crops.

These soils are used mainly for low-grade hardwood and redcedar trees, or they are used as pasture. Arkana soils are poorly suited to use as pasture. Adapted pasture plants are tall fescue, lovegrass, lespedeza, and white clover. Moko soils are not suited to use as pasture and should not be cleared of their native vegetation because erosion is a very severe hazard.

Arkana soils are poorly suited to use as woodland. Adapted trees include redcedar and shortleaf pine. Seedling mortality is a moderate limitation. Moko soils are poorly suited to use as woodland. Redcedar is best adapted to the Moko soils. Restricted use of equipment is a severe limitation, and seedling mortality and the hazard of erosion are moderate limitations.

Arkana soils are poorly suited to most urban uses. The shrink-swell potential is a severe limitation for dwellings and small commercial buildings. Low strength and the shrink-swell potential are severe limitations for local roads and streets. These limitations generally can be overcome by proper design and engineering and construction techniques. The very slow permeability and depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome. Moko soils are poorly suited to most urban uses. Depth to rock and large stones are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

The soils in this map unit are in capability unit VIs-1; Arkana soils are in woodland suitability group 5c8 and Moko soils in woodland suitability group 5x3.

4—Arkana-Moko complex, 8 to 20 percent slopes. This complex consists of Arkana and Moko soils on ridges and hillsides. The areas are so small and intermingled that it was not practical to map them separately. The areas of each soil are about 1 acre to 5 acres in size, and the mapped areas are about 20 to 200 acres in size. Slopes are uneven and convex and include rock ledges.

Arkana soils make up about 60 percent of each mapped area. Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is dark brown and brown very cherty silt loam to a depth of about 7 inches. The subsoil is yellowish red very cherty silty clay to a depth of about 16 inches; yellowish red cherty clay to a depth of about 21 inches; and dark yellowish brown clay to a depth of about 28 inches. The underlying material is hard, level-bedded dolomite.

Arkana soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from medium acid to mildly alkaline in the surface and subsurface layers and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. The rooting zone is moderately deep and can be penetrated by roots down to the clayey subsoil, which somewhat restricts further penetration.

Moko soils make up about 30 percent of each mapped area. Typically, the soil is very dark brown and very dark grayish brown very stony clay loam about 10 inches thick over hard dolomite bedrock.

Moko soils are moderate in natural fertility and moderate to high in content of organic matter. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

The remaining 10 percent of this complex consists of small areas of Agnos, Doniphan, Gassville, and Noark soils, outcrops of bedrock, and areas of soils that are similar to Arkana soils except that they are deeper than 40 inches to bedrock. Also included are small areas of Elsah and Secesh soils on narrow flood plains.

The soils making up this complex are not suited to cultivated crops.

These soils are used mainly for low-grade hardwood and redcedar trees, or they are used as pasture. Arkana soils are poorly suited to use as pasture. Adapted pasture plants include tall fescue, lovegrass, lespedeza, and white clover. Moko soils are not suited to use as pasture and should not be cleared of their native vegetation because erosion is a very severe hazard.

Arkana soils are poorly suited to use as woodland. Adapted trees include redcedar and shortleaf pine. Restricted use of equipment and seedling mortality are moderate limitations to woodland use and management. Moko soils are poorly suited to use as woodland. Redcedar is best adapted to Moko soils. Restricted use of equipment, the hazard of erosion, and seedling mortality are severe limitations.

Arkana soils are poorly suited to most urban uses. The shrink-swell potential is a severe limitation for dwellings. Slope and the shrink-swell potential are severe limitations for small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for roads and streets. These limitations generally can be

overcome by proper design and engineering and construction procedures. The very slow permeability and depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome. Moko soils are poorly suited to most urban uses. Depth to rock, slope, and large stones are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

This map unit is in capability unit VIIs-1; Arkana soils are in woodland suitability group 5c8 and Moko soils in woodland suitability group 5x3.

5—Arkana-Moko complex, 20 to 40 percent slopes. This complex consists of Arkana and Moko soils on steep hillsides. The areas of the individual soils are so small and intermingled that it was not practical to map the soils separately. The areas of each soil are about 3 to 5 acres in size, and the mapped areas range from about 20 to 150 acres in size. Slopes are uneven and convex; in many places they have a stepped appearance caused by outcrops of horizontally bedded limestone or dolomite bedrock.

Arkana soils make up about 55 percent of each mapped area. Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is dark brown and brown very cherty silt loam to a depth of about 7 inches. The subsoil is yellowish red very cherty silty clay to a depth of about 16 inches; yellowish red cherty clay to a depth of about 21 inches; and dark yellowish brown clay to a depth of about 28 inches. The underlying material is hard, level-bedded dolomite.

Arkana soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from medium acid to mildly alkaline in the surface and subsurface layers and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. The rooting zone is moderately deep and can be penetrated by roots down to the clayey subsoil, which somewhat restricts further penetration.

Moko soils make up about 35 percent of each mapped area. Typically, the soil is very dark brown and very dark grayish brown very stony clay loam about 10 inches thick over hard, level-bedded dolomite bedrock.

Moko soils are moderate in natural fertility and moderate to high in content of organic matter. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

The remaining 10 percent of this complex consists of small areas of Gassville and Noark soils, areas of soils that have slopes of more than 40 percent, outcrops of bedrock, and areas of soils that are similar to Arkana soils except that they are deeper than 40 inches to bedrock. Also included are small areas of Elsah and Secesh soils along narrow flood plains.

The soils making up this complex are not suited to cultivated crops.

These soils are mainly used as woodland of low-grade hardwood and redcedar trees and as wildlife habitat. These soils are not suited to use as pasture. They should not be cleared of the native vegetation because the hazard of erosion is very severe.

Arkana soils are poorly suited to use as woodland. Adapted trees include eastern redcedar and shortleaf pine. Restricted use of equipment and seedling mortality are severe limitations, and the hazard of erosion is a moderate limitation. Moko soils are poorly suited to use as woodland. Eastern redcedar is best adapted to Moko soils. Restrictions on the use of equipment, the hazard of erosion, and seedling mortality are severe limitations to woodland use and management on Moko soils.

Arkana soils are poorly suited to urban uses. Slope and the shrink-swell potential are severe limitations for dwellings and small commercial buildings. Slope, low strength, and the shrink-swell potential are severe limitations for roads and streets. The very slow permeability, depth to rock, and slope are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome. Moko soils are poorly suited to urban uses. Depth to rock, large stones, and slope are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

This map unit is in capability unit VIIs-1; Arkana soils are in woodland suitability group 5c9, and Moko soils are in woodland suitability group 5x3.

6—Boden gravelly sandy loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on ridgetops. Slopes are uneven and convex. The individual areas range from about 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown gravelly sandy loam about 3 inches thick. The subsurface layer is brown gravelly sandy loam to a depth of about 7 inches. The subsoil is yellowish red sandy clay loam to a depth of about 12 inches; red sandy clay to a depth of about 26 inches; and mottled, red, strong brown, and grayish brown clay to a depth of about 48 inches. The underlying material is soft, level-bedded, weathered siltstone.

This soil is low in natural fertility and in content of organic matter. Reaction is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately slow, and the available water capacity is medium. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are small areas of Brockwell and Portia soils. Also included are outcrops of bedrock and small areas of soils that have bedrock at a depth of more than 60 inches.

Boden soils are moderately suited to cultivated crops. Runoff is medium, erosion is a hazard, and surface

gravel interferes with tillage operations if cultivated crops are grown. Suitable crops include corn and small grains. Under management that includes minimum tillage, terraces, and contour cultivation, crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is mainly used as pasture. It is moderately suited to this use. Suitable pasture plants include bermudagrass, tall fescue, white clover, bahiagrass, and lovegrass.

This soil is moderately suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, and red oak. There are no significant limitations to woodland use or management.

This soil is moderately suited to most urban uses. The shrink-swell potential is a moderate limitation for dwellings. Slope and the shrink-swell potential are moderate limitations for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by good design and engineering and construction techniques. The moderately slow permeability is a severe limitation for septic tank absorption fields. This limitation is generally difficult or impractical to overcome.

This soil is in capability unit IIIe-1 and in woodland suitability group 4o7.

7—Boden gravelly sandy loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on hillsides. Slopes are uneven and convex. The individual areas range from about 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown gravelly sandy loam about 3 inches thick. The subsurface layer is brown gravelly sandy loam to a depth of about 7 inches. The subsoil is yellowish red sandy clay loam to a depth of about 12 inches; red sandy clay to a depth of about 26 inches; and mottled, red, strong brown, and grayish brown clay to a depth of about 48 inches. The underlying material is soft, level-bedded, weathered siltstone.

This soil is low in natural fertility and in content of organic matter. Reaction is medium acid to very strongly acid in the surface and subsurface layers and strongly acid or very strongly acid in the subsoil. Permeability is moderately slow, and the available water capacity is medium. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are small areas of Brockwell and Portia soils. Also included are outcrops of bedrock, small areas of soils that have bedrock at a depth of more than 60 inches, and areas of soils that have surface stones.

This soil is not suited to cultivated crops. If cultivated crops are grown, runoff is rapid and erosion is a very severe hazard.

The soil is used mainly as woodland and pasture. This soil is moderately suited to pasture and hay crops. Suitable pasture plants include tall fescue, white clover, bermudagrass, and bahiagrass.

This soil is moderately suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, and red oak. There are no significant limitations to woodland use or management.

This soil is poorly suited to most urban uses. Slope and the shrink-swell potential are moderate limitations for dwellings. Low strength is a severe limitation for small commercial buildings. These limitations generally can be overcome by proper engineering design and installation. The moderately slow permeability is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

This soil is in capability unit VIe-1 and in woodland suitability group 4o7.

8—Brockwell fine sandy loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on uplands. Slopes are smooth and convex. The individual areas are 10 to 100 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 6 inches thick. The subsurface layer is brown sandy loam and extends to a depth of about 12 inches. The subsoil is brown sandy loam to a depth of about 17 inches; strong brown fine sandy loam to a depth of about 31 inches; strong brown and pale brown, mottled fine sandy loam to a depth of about 53 inches; and mottled, yellowish red, brown, and red sandy clay loam to a depth of 80 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are small areas of soils that have a gravelly or stony surface layer, small areas of eroded soils, and small areas of soils that have bedrock at a depth of less than 60 inches. Also included are small areas of Portia, Agnos, and Boden soils and of soils that are similar to Brockwell soils except that they have a subsoil that is sandy clay or clay in the lower part.

This soil is moderately suited to cultivated crops. Suitable crops include corn, small grains, and truck crops. If cultivated crops are grown, runoff is medium and the hazard of erosion is severe. Under management that includes minimum tillage, contour cultivation, and terraces, clean-tilled crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

In most areas, this soil has been cleared and is used for hay and pasture, to which it is well suited. Suitable pasture plants include tall fescue, lovegrass, white clover, bermudagrass, and lespedeza.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, white oak, and red oak. There are no significant limitations to woodland use and management.

This soil is well suited to most urban uses. There are no significant limitations for septic tank absorption fields, local roads and streets, and dwellings. Slope is a moderate limitation for small commercial buildings. In most places, this limitation can be overcome by good design and engineering and construction procedures.

This soil is in capability unit IIIe-1 and in woodland suitability group 3o7.

9—Brockwell fine sandy loam, 8 to 12 percent slopes, eroded. This is a deep, well drained, moderately sloping soil on uplands. Slopes are smooth and convex. The individual areas are 20 to 100 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 3 inches thick. The subsurface layer is brown sandy loam to a depth of about 9 inches. The subsoil is brown sandy loam to a depth of about 17 inches; strong brown fine sandy loam to a depth of about 31 inches; strong brown and pale brown, mottled fine sandy loam to a depth of about 53 inches; and mottled yellowish red, brown, and red sandy clay loam to a depth of 80 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots. Sheet and rill erosion have reduced the thickness of the surface layer in most places and exposed the subsoil in some places. A few areas are gullied to a depth of 10 feet or more; the gullies are 50 to 100 feet wide. These areas are difficult to reclaim and require major conservation treatment.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer, small areas of stony soils, and small areas of soils that have bedrock at a depth of less than 60 inches. Also included are small areas of Agnos, Portia, and Boden soils and of soils that are similar to Brockwell soils except that they have a subsoil that is sandy clay or clay in the lower part.

This soil is poorly suited to cultivated crops. Suitable crops include corn, small grains, and truck crops. Erosion is a very severe hazard if cultivated crops are grown. Under management that includes minimum tillage, contour cultivation, and terraces, sown crops that leave large amounts of residue can be safely grown occasionally in a cropping system that includes close-growing cover most of the time. Conservation measures need to be intensified as slope length and gradient increase.

In most areas, this soil has been cleared and is used for hay and pasture. It is moderately suited to this use. Suitable pasture plants include tall fescue, lovegrass, white clover, bermudagrass, and lespedeza.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, white oak, and red oak. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. Slope is a moderate limitation for local roads and streets, dwellings, and septic tank absorption fields. Slope is a severe limitation for small commercial buildings. This limitation generally can be overcome by good design and engineering and construction procedures.

This soil is in capability unit IVe-1 and in woodland suitability group 3o7.

10—Brockwell gravelly sandy loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on broad upland flats. Slopes are smooth and convex. The individual areas are 10 to 20 acres in size.

Typically, the surface layer is grayish brown gravelly sandy loam about 6 inches thick. The subsurface layer is brown gravelly sandy loam to a depth of about 9 inches. The subsoil is brown gravelly sandy loam to a depth of about 17 inches; strong brown fine sandy loam to a depth of about 31 inches; strong brown and pale brown, mottled fine sandy loam to a depth of about 53 inches; and mottled, yellowish red, brown, and red sandy clay loam to a depth of 80 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. Gravel is a slight hindrance to tillage. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are small areas of soils that are free of gravel, small areas of eroded soils, small areas of stony soils, and small areas of soils that have bedrock at a depth of less than 60 inches. Also included are small areas of Agnos, Portia, and Boden soils, and areas of soils that are similar to Brockwell soils except that they have a subsoil that is sandy clay or clay in the lower part.

This soil is moderately suited to cultivated crops. Suitable crops include corn, small grains, and truck crops. Runoff is medium, and erosion is a hazard if cultivated crops are grown. Under management that includes minimum tillage, contour cultivation, and terraces, crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is mainly used for hay and pasture. This soil is well suited to use as pasture. Suitable pasture plants include tall fescue, lovegrass, white clover, bermudagrass, and lespedeza.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, white oak, and red oak (fig. 4). There are no significant limitations to woodland use and management.

Figure 4.—Shortleaf pine, after thinning, on Brockwell gravelly sandy loam, 3 to 8 percent slopes. This soil is well suited to use as woodland.

There are no significant limitations for septic tank absorption fields, dwellings, or local roads and streets. Slope is a moderate limitation for small commercial buildings. In most places, this limitation can be overcome by good design and engineering and construction procedures.

This soil is in capability unit IIIe-1 and in woodland suitability group 3o7.

11—Brockwell gravelly sandy loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on rolling uplands and hillsides. Slopes are smooth and convex. The individual areas are 10 to 150 acres in size.

Typically, the surface layer is grayish brown gravelly sandy loam about 6 inches thick. The subsurface layer is brown gravelly sandy loam to a depth of about 9 inches. The subsoil is brown gravelly sandy loam to a depth of about 17 inches; strong brown fine sandy loam to a depth of about 31 inches; strong brown and pale brown, mottled fine sandy loam to a depth of about 53 inches; and mottled, yellowish red, brown, and red sandy clay loam to a depth of 80 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. Gravel is a slight hindrance to tillage. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are small areas of soils that are free of gravel, small areas of eroded or stony soils, and small areas of soils that have bedrock at a depth of less than 60 inches. Also included are small areas of Agnos, Portia, and Boden soils, and areas of

soils that are similar to Brockwell soils except that they have a subsoil that is sandy clay or clay in the lower part.

This soil is not suited to cultivated crops. Runoff is rapid, and if cultivated crops are grown, the hazard of erosion is very severe.

This soil is mainly in woodland of upland hardwoods and pine or is used as pasture. This soil is moderately suited to use as pasture. Suitable pasture plants include tall fescue, lovegrass, white clover, lespedeza, and bermudagrass.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, white oak, and red oak. There are no significant limitations to woodland use and management.

Slope is a moderate limitation for dwellings, local roads and streets, and septic tank absorption fields. Slope is a severe limitation for small commercial buildings. These limitations generally can be overcome by good design and engineering and construction procedures.

This soil is in capability unit VIe-1 and in woodland suitability group 3o7.

12—Captina silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on broad uplands, ridges, and stream terraces. Slopes are smooth and convex. The individual areas range from about 10 to 70 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is yellowish brown silt loam to a depth of about 13 inches and strong brown silty clay loam to a depth of about 20 inches. It is strong brown, mottled cherty silty clay loam and mottled, light gray, strong brown, yellowish red, and yellowish brown very cherty silty clay loam, which is a compact and brittle fragipan, to a depth of about 46 inches. To a depth of 72 inches or more it is red, mottled cherty clay.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface layer and from strongly acid to extremely acid in the subsoil. Permeability is slow, and the available water capacity is medium. The soil can be worked within a wide range of moisture content. There is a perched water table above the fragipan late in winter and early in spring. The fragipan restricts root penetration and slows the movement of water through the soil.

Included with this soil in mapping are small areas of Agnos, Gassville, Gepp, and Doniphan soils, a few small areas where the soils are eroded, areas of soils that have a surface layer of cherty silt loam, and areas of soils that have slopes of less than 3 percent.

This soil is moderately suited to cultivated crops. Suitable crops include corn, soybeans, small grains, and truck crops. Runoff is medium and erosion is a moderate hazard if cultivated crops are grown. Under management that includes minimum tillage, contour cultivation, and terraces on long slopes, clean-tilled crops that leave large amounts of residue can be grown safely year after year.

This soil is mainly used as pasture and for hay crops. This soil is well suited to use as pasture. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass.

This soil is moderately suited to use as woodland. Suitable trees are shortleaf pine, loblolly pine, and red oak. There are no significant limitations to woodland use and management.

Wetness is a moderate limitation for dwellings. Slope and wetness are moderate limitations for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by proper engineering design and drainage. The slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations can be partly overcome by increasing the size of the absorption area or modifying the absorption field.

This soil is in capability unit IIIe-2 and in woodland suitability group 4o7.

13—Estate-Portia-Moko association, rolling. This association consists of deep and shallow, well drained soils on rolling upland ridges and side slopes. The individual soils are in areas large enough to be mapped separately, but they were not separated because of poor accessibility and low intensity of use. The soils generally are in a regular and repeating pattern and are in about the same relative proportions in each mapped area. The mapped areas range from about 40 to 250 acres in size. Slopes range from 8 to 20 percent.

Estate soils formed in residuum of weathered interbedded sandstone and limestone. These soils are on upper side slopes. Portia soils formed in residuum or colluvium of weathered interbedded sandstone and limestone. These soils are on the less sloping foot slopes. Moko soils formed in residuum of weathered limestone. These soils are on side slopes near limestone outcrops.

Estate soils are deep. They make up about 40 percent of this association. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown stony sandy loam to a depth of about 7 inches. The subsoil is yellowish red sandy loam to a depth of about 13 inches, yellowish red clay loam to a depth of about 22 inches, red clay loam to a depth of about 37 inches, and red clay to a depth of about 48 inches. The underlying material is hard, undulating limestone bedrock.

Estate soils are low in natural fertility and in content of organic matter. Reaction ranges from neutral to strongly acid in the surface and subsurface layers and neutral to medium acid in the subsoil. Permeability is slow, and the available water capacity is medium. The rooting zone is deep and easily penetrated by roots.

Portia soils are deep. They make up about 30 percent of this association. Typically, the surface layer is brown

sandy loam about 7 inches thick. The subsoil is dark brown loam to a depth of about 12 inches, reddish brown loam to a depth of about 30 inches, yellowish red loam to a depth of about 51 inches, red clay loam to a depth of about 63 inches, and red clay to a depth of 80 inches or more.

Portia soils are low in natural fertility and in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface layer, medium acid to very strongly acid in the upper part of the subsoil, and medium acid to strongly acid in the lower part of the subsoil. Permeability is moderately slow, and the available water capacity is medium. Tilth is good, and the soils can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots.

Moko soils are shallow. They make up about 20 percent of this association. Typically, the soil is very dark brown and very dark grayish brown very stony clay loam about 10 inches thick over hard limestone bedrock.

Moko soils are moderate in natural fertility and moderate to high in content of organic matter. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

The remaining 10 percent of this association is made up of small areas of Arkana and Noark soils, a few small areas of exposed bedrock, and areas of soils that have slopes of less than 8 percent.

Estate and Moko soils are not suited to cultivated crops. Slope, runoff, surface stoniness, and depth to bedrock severely limit the use of these soils for cultivated crops. Portia soils are poorly suited to cultivated crops. Slope, runoff, and a very severe hazard of erosion limit the use of Portia soils for cultivated crops. Adapted crops include small grains. Under management that includes minimum tillage, contour cultivation, and terracing, sown crops can be grown occasionally in a cropping system that includes close-growing cover most of the time. Conservation measures need to be intensified as slope length and gradient increase.

In most places, the Portia soils in this association have been cleared and are used as improved pasture. They are well suited to this use. Moko soils are not suited to use as improved pasture, and Estate soils are poorly suited. Suitable pasture plants include bermudagrass, lovegrass, lespedeza, tall fescue, and white clover.

The Estate and Moko soils in this association are used mainly as woodland in mixed upland hardwoods, pine, and redcedar. Estate soils are moderately suited to use as woodland. Suitable trees include red oak, white oak, shortleaf pine, loblolly pine, and redcedar. Restrictions on the use of equipment and the hazard of erosion are moderate limitations to woodland use and management. Portia soils are well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, and sweetgum. The hazard of erosion is a moderate limitation to woodland use and management. Moko soils are poorly suited to use as woodland. Redcedar is best adapted to Moko soils. Restrictions on the use of equipment, seedling mortality, and the hazard of erosion are severe limitations to woodland use and management.

Estate soils are poorly suited to most urban uses. The shrink-swell potential and slope are moderate limitations for dwellings. Slope is a severe limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. The slow permeability is a severe limitation for septic tank absorption fields. Some of these limitations can be overcome by good design and engineering and construction procedures. Portia soils are moderately suited to most urban uses. Slope is a moderate limitation for dwellings and a severe limitation for small commercial buildings. Low strength and slope are moderate limitations for local roads and streets. The moderately slow permeability is a severe limitation for septic tank absorption fields. Most of these limitations generally can be overcome by good design and engineering and construction procedures. Moko soils are poorly suited to most urban uses. Depth to bedrock and large stones are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for small commercial buildings. These limitations are difficult and in most places impractical to overcome.

Estate soils are in capability unit VIs-2 and in woodland suitability group 4x8. Portia soils are in capability unit IVe-1 and in woodland suitability group 3r8. Moko soils are in capability unit VIIs-4 and in woodland suitability group 5x3.

14—Estate-Portia-Moko association, steep. This association consists of deep and shallow, well drained soils on steep side slopes. The individual soils are in areas large enough to be mapped separately, but they were not separated because of poor accessibility and low intensity of use. The soils generally are in a regular and repeating pattern and are in about the same relative proportions in each mapped area. The mapped areas range from about 40 to 500 acres in size.

Estate soils formed in residuum of weathered interbedded sandstone and limestone. These soils are on upper side slopes. Portia soils formed in residuum or colluvium of weathered interbedded sandstone and limestone. These soils are on the less sloping foot slopes. Moko soils formed in residuum of weathered limestone. These soils are on side slopes near limestone outcrops. Slopes range from 20 to 40 percent for the Estate and Moko soils and from 20 to 30 percent for the Portia soils.

Estate soils are deep. They make up about 40 percent of this association. Typically, the surface layer is dark grayish brown stony sandy loam about 2 inches thick. The subsurface layer is yellowish brown stony sandy loam to a depth of about 7 inches. The subsoil is yellowish red sandy loam to a depth of about 13 inches,

yellowish red clay loam to a depth of about 22 inches, red clay loam to a depth of about 37 inches, and red clay to a depth of about 48 inches. The underlying material is hard, undulating limestone bedrock.

Estate soils are low in natural fertility and in content of organic matter. Reaction ranges from neutral to strongly acid in the surface and subsurface layers and neutral to medium acid in the subsoil. Permeability is slow, and the available water capacity is medium. The rooting zone is deep and easily penetrated by roots.

Portia soils are deep. They make up about 20 percent of this association. Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is dark brown loam to a depth of about 12 inches, reddish brown loam to a depth of about 30 inches, yellowish red loam to a depth of about 51 inches, red clay loam to a depth of about 63 inches, and red clay to a depth of 80 inches or more.

Portia soils are low in natural fertility and in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface layer, medium acid to very strongly acid in the upper part of the subsoil, and medium acid to strongly acid in the lower part of the subsoil. Permeability is moderately slow, and the available water capacity is medium. The rooting zone is deep and easily penetrated by roots.

Moko soils are shallow. They make up about 20 percent of this association. Typically, the soil is very dark brown and very dark grayish brown very stony clay loam about 10 inches thick over hard limestone bedrock.

Moko soils are moderate in natural fertility and moderate to high in content of organic matter. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

The remaining 20 percent of this association is made up of small areas of Arkana and Noark soils, massive and nearly vertical escarpments of interbedded sandstone and limestone, and small areas of limestone and sandstone outcrops.

The soils in this association are not suited to cultivated crops or to use as improved pasture. Steepness of slopes, surface stoniness, and escarpments limit the use of these soils to woodland, rangeland, wildlife habitat, and recreation. These soils are mainly in woodland.

Estate soils are moderately suited to use as woodland. Suitable trees include red oak, white oak, shortleaf pine, loblolly pine, and redcedar. The hazard of erosion and restrictions on the use of equipment are severe limitations to woodland use and management. Portia soils are well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and sweetgum. The hazard of erosion and restrictions on the use of equipment are moderate limitations to woodland use and management. Moko soils are poorly suited to use as woodland. Redcedar is best adapted to Moko soils. The hazard of erosion, seedling mortality, and restrictions on the use of equipment are severe limitations to woodland use and management.

The soils in this association are poorly suited to most urban uses. Estate soils have severe limitations for dwellings and small commercial buildings because of slope. Low strength and slope are severe limitations for roads and streets. The slow permeability and slope are severe limitations for septic tank absorption fields. Portia soils have severe limitations for dwellings, small commercial buildings, and local roads and streets because of slope. The moderately slow permeability and slope are severe limitations for septic tank absorption fields. Moko soils have severe limitations for dwellings, small commercial buildings, roads and streets, and septic tank absorption fields because of depth to bedrock, large stones, and slope. These limitations are difficult or impractical to overcome.

Estate soils are in capability unit VIIs-2 and in woodland suitability group 4x9. Portia soils are in capability unit VIe-1 and in woodland suitability group 3r9. Moko soils are in capability unit VIIs-4 and in woodland suitability group 5x3.

15—Gassville very cherty silt loam, 8 to 20 percent slopes. This is a moderately deep to deep, well drained, moderately sloping to moderately steep soil on upland ridges and hillsides. Slopes are uneven and convex. The individual areas range from about 20 to 400 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 9 inches. The subsoil is yellowish red cherty clay to a depth of about 17 inches; red cherty clay to a depth of about 23 inches; and mottled, yellowish red and strong brown clay to a depth of about 40 inches. The underlying material is soft siltstone bedrock to a depth of about 58 inches over hard dolomite bedrock.

This soil is low in natural fertility and moderate in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface and subsurface layers and is strongly acid or very strongly acid in the subsoil. Permeability is very slow, and the available water capacity is low. Surface chertiness and slope limit the use of farm equipment. The rooting zone is moderately deep, and the clay subsoil slows root penetration.

Included with this soil in mapping are small areas of soils that are similar to Gassville soils but that are less than 40 inches or more than 60 inches deep to hard bedrock. Also included are small areas of Arkana, Moko, and Doniphan soils.

This soil is not suited to cultivated crops. Runoff is rapid, and the hazard of erosion is very severe.

The soil is mainly used as woodland of low-grade upland hardwoods or as pasture. This soil is moderately suited to use as pasture (fig. 5). Suitable pasture plants include tall fescue, white clover, lovegrass, and lespedeza.

Figure 5.—Aerial-seeded tall fescue and upland hardwoods on Gassville very cherty silt loam, 8 to 20 percent slopes.

This soil is moderately suited to use as woodland. Suitable trees include shortleaf pine, eastern redcedar, and red oak. There are no significant limitations to woodland use and management.

This soil is poorly suited to most urban uses. Slope and the shrink-swell potential are moderate limitations for dwellings. Slope is a severe limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations can be partly overcome with proper engineering design and installation. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation is generally difficult or impractical to overcome.

This soil is in capability unit VIe-2 and in woodland suitability group 4o7.

16—Gassville-Doniphan complex, 3 to 8 percent slopes. This complex is made up of Gassville and Doniphan soils in small areas that are so intermingled that they could not be separated at the scale selected

for mapping. Mapped areas range from about 10 to 200 acres in size and are on low upland ridges. The individual areas of each soil are about 3 to 5 acres in size.

Gassville soils make up about 45 percent of each mapped area. Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 9 inches. The subsoil is yellowish red cherty clay to a depth of about 17 inches; red cherty clay to a depth of about 23 inches; and mottled, yellowish red and strong brown clay to a depth of about 40 inches. The underlying material is soft, weathered siltstone to a depth of about 58 inches over hard dolomite bedrock.

Gassville soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface and subsurface layers and is strongly acid or very strongly acid in the subsoil. Permeability is very slow, and the available water capacity is low. The many chert fragments make tillage difficult. The rooting zone is moderately deep, and the clayey subsoil slows root penetration.

Doniphan soils make up about 40 percent of each mapped area. Typically, the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown very cherty silt loam to a depth of about 8 inches. The subsoil is strong brown very cherty silt loam to a depth of about 19 inches; yellowish red, mottled cherty silty clay to a depth of about 30 inches; dark red, mottled clay to a depth of about 55 inches; and mottled, dark red, strong brown, and light gray clay to a depth of 72 inches or more.

Doniphan soils are low in natural fertility and moderate in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface and subsurface layers and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is medium. Tilth is difficult to maintain, and the very cherty surface limits use of some tillage equipment. The rooting zone is moderately deep and can be penetrated by roots to the clayey subsoil, which somewhat restricts further penetration.

The remaining 15 percent of this map unit is made up of small areas of Arkana, Captina, and Moko soils.

The soils making up this complex are poorly suited to cultivated crops. Slope, surface chertiness, and the hazard of erosion are the main limitations. Suitable crops include small grains. Under management that includes terraces and contour cultivation, sown crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

In most areas, these soils have been cleared and are in pasture. They are moderately suited to this use (fig. 6). Suitable pasture plants include tall fescue, white clover, lovegrass, and lespedeza.

These soils are moderately suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, white oak, and red oak. There are no significant limitations to woodland use or management.

These soils are poorly suited to most urban uses. Gassville soils have moderate limitations for dwellings because of the shrink-swell potential. Slope and the shrink-swell potential are moderate limitations for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations can be partly overcome by good design and engineering and construction procedures. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation is difficult to overcome but can be minimized by increasing the size of the filter field. Doniphan soils have moderate limitations for dwellings because of the shrink-swell potential. Slope and the shrink-swell potential are moderate limitations for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations can be partly overcome by good design and engineering and construction techniques. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be partly overcome by increasing the size of the field or by modifying the field itself.

This map unit is in capability unit IVe-2 and in woodland suitability group 4o7.

17—Gepp very cherty silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on uplands. Slopes are smooth and convex. The areas range from about 20 to 300 acres in size.

Typically, the surface layer is brown very cherty silt loam about 7 inches thick. The subsoil is yellowish red cherty silty clay loam to a depth of about 12 inches; below that, it is red clay to a depth of about 40 inches; and below that it is red, mottled cherty clay to a depth of about 75 inches. Bedrock is cherty dolomite that has cracks and crevices filled with red clay.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface layer and medium acid to very strongly acid in the upper part of the subsoil; it is medium acid or strongly acid in the lower part of the subsoil. Permeability is moderate, and the available water capacity is medium. Tilth is difficult to maintain, and the very cherty surface layer makes tillage difficult. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are a few small areas of Gassville, Doniphan, Arkana, and Moko soils and a few areas of soils that have a silt loam surface layer.

This soil is poorly suited to cultivated crops. Runoff is medium to rapid, and erosion is a very severe hazard if cultivated crops are grown. Under management that includes minimum tillage, terraces, and contour cultivation, sown crops that leave large amounts of residue can be grown year after year. Conservation

Figure 6.—Brush has been controlled in this area of Gassville-Doniphan complex, 3 to 8 percent slopes. Most areas have been cleared for use as pasture.

measures need to be intensified as slope length and gradient increase.

This soil is mainly used as pasture. It is moderately suited to this use (fig. 7). Suitable pasture plants include bermudagrass, tall fescue, white clover, and annual lespedeza.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and white oak. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. The shrink-swell potential is a moderate limitation for dwellings and small commercial buildings. Slope is also a moderate limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by good

design and careful engineering and construction procedures. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be partly overcome by increasing the size of the field or by modifying the field itself.

This soil is in capability unit IVe-2 and in woodland suitability group 3o7.

18—Gepp very cherty silt loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on upland ridges and side slopes. Slopes are smooth and convex. The areas range from about 20 to 500 acres in size.

Typically, the surface layer is brown very cherty silt loam about 7 inches thick. The subsoil is yellowish red cherty silty clay loam to a depth of about 12 inches; below that, it is red clay to a depth of about 40 inches; and below that, it is red, mottled cherty clay to a depth of about 75 inches. The underlying material is cherty dolomite that has cracks and crevices filled with red clay.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface layer and medium acid to very strongly acid in the upper part of the subsoil; it is medium acid or strongly acid in the lower part of the subsoil. Permeability is moderate, and the available water capacity is medium. Tilth is difficult to maintain, and the very cherty surface layer makes tillage difficult. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are a few small areas of Gassville, Doniphan, Arkana, and Moko soils, a few areas of soils that have a silt loam surface layer, and areas of soils that have slopes of more than 20 percent.

This soil is not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard if cultivated crops are grown.

This soil is mainly used as woodland of low-grade upland hardwoods or as pasture. This soil is moderately suited to use as pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and annual lespedeza.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and

Figure 7.—Tall fescue pasture on Gepp very cherty silt loam, 3 to 8 percent slopes.

white oak. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. Slope and the shrink-swell potential are moderate limitations for dwellings. Slope is a severe limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations can be partly overcome by good design and engineering and construction procedures. Slope and permeability are moderate limitations for septic tank absorption fields. These limitations can be partly overcome by increasing the size of the field or by modifying the field itself.

This soil is in capability unit VIe-2 and in woodland suitability group 3o7.

19—Hontas silt loam, frequently flooded. This is a deep, moderately well drained, level soil on flood plains of creeks and rivers. Slope is 0 to 1 percent. Individual areas range from 20 to more than 200 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The layer below that is dark yellowish brown silt loam to a depth of about 11 inches. The subsoil is yellowish brown, mottled silt loam to a depth of about 22 inches; below that, it is grayish brown, mottled silt loam to a depth of about 40 inches. The underlying material is gray, mottled silty clay loam to a depth of 72 inches or more.

This soil is high in natural fertility and moderate in content of organic matter. The surface layer is slightly acid or neutral, the subsoil is medium acid or slightly acid, and the underlying material ranges from slightly acid to mildly alkaline. Permeability is moderate, and the available water capacity is high. There is an apparent water table in this soil late in winter and early in spring. This soil is flooded frequently by fast-moving water for brief periods between December and June. Crops on this soil respond well to fertilizer, and tilth is easy to maintain.

Included with this soil in mapping are a few areas of Melvin and Wideman soils.

This soil is poorly suited to cultivated crops because of frequent flooding. Planting is often delayed, and in some years crops are severely damaged or destroyed by floodwater. Under good management, short-season crops that leave large amounts of residue can be grown in most years. The main crops are soybeans and grain sorghum.

This soil is well suited to use as pasture, and this is its main use. Suitable pasture plants include bermudagrass, tall fescue, and white clover.

This soil is well suited to use as woodland. Suitable trees include loblolly pine, shortleaf pine, black walnut, and sweetgum. Equipment limitations and seedling mortality caused by flooding and wetness are moderate limitations to woodland use and management.

This soil has severe limitations for most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Flooding and wetness are severe limitations for septic tank absorption fields. These limitations can be overcome only by major flood control measures.

This soil is in capability unit IVw-1 and in woodland suitability group 2w8.

20—Melvin silt loam, frequently flooded. This is a deep, poorly drained, level soil on flood plains of creeks and rivers (fig. 8). Slope is 0 to 1 percent. Individual areas range from 20 to more than 100 acres in size.

Typically, the surface layer is brown, mottled silt loam about 6 inches thick. The subsoil is light brownish gray, mottled silt loam to a depth of about 16 inches and light gray, mottled silt loam to a depth of about 30 inches. The underlying material is light gray and gray, mottled silt loam and silty clay loam to a depth of 72 inches or more.

This soil is high in natural fertility and moderate in content of organic matter. Reaction ranges from slightly acid to mildly alkaline throughout. Permeability is moderate, and the available water capacity is high. There is an apparent water table in this soil late in winter and early in spring. This soil is frequently flooded by fast-moving water for brief periods between December and June. Pasture crops on this soil respond well to fertilizer, and tilth is easy to maintain.

Included with this soil in mapping are a few areas of Hontas and Wideman soils.

This soil generally is not suited to cultivated crops because of frequent flooding. Planting is often delayed, and in some years crops are severely damaged or destroyed by floodwater.

This soil is well suited to use as pasture, and this is its main use. Suitable pasture plants include bermudagrass, tall fescue, and white clover.

This soil is well suited to use as woodland. Adapted trees include American sycamore and eastern cottonwood. Restricted use of equipment and seedling mortality caused by wetness and flooding are severe limitations to woodland use and management.

This soil has severe limitations for most urban uses. Flooding and wetness are severe limitations for dwellings, small commercial buildings, septic tank absorption fields, and local roads and streets. These limitations can be overcome only by major flood control and drainage measures. Also, low strength is a severe limitation for local roads and streets.

This soil is in capability unit Vw-1 and in woodland suitability group 1w6.

21—Moko-Rock outcrop complex, 20 to 50 percent slopes. This complex consists of a Moko soil and Rock outcrop on steep hillsides. The areas are so intermingled that it was not practical to map them separately at the scale selected for mapping. The individual areas of each of the components range from about 1 to 4 acres in size. The mapped areas range from about 10 to 100 acres in size.

Moko very stony clay loam makes up about 70 percent of each mapped area. Typically, the soil is very dark

brown and very dark grayish brown very stony clay loam about 10 inches thick over hard dolomite bedrock.

This soil is moderate in natural fertility and moderate to high in content of organic matter. Reaction is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Rock outcrop makes up about 20 percent of each mapped area. Typically, it is hard, level-bedded dolomite or limestone.

The remaining 10 percent of this complex consists of small areas of Arkana soils, quarries, areas of soils that have slopes of more than 50 percent, and vertical bluffs and escarpments of dolomite, limestone, and sandstone.

The soils in this complex are not suited to cultivated crops or to use as improved pasture. They are better suited to use as wildlife habitat or range or for recreation. Soils in this complex should not be cleared. Erosion is a very severe hazard if the native vegetation is disturbed. Stones and rock outcrops make cultivation impractical. The soils are used mainly as rangeland.

The soils are poorly suited to use as woodland. Eastern redcedar is best adapted to these soils. Restrictions on the use of equipment, the hazard of erosion, and seedling mortality are severe limitations to woodland use and management.

The soils are poorly suited to most urban uses. Shallowness to bedrock, large stones, slope, and exposed bedrock are severe limitations for dwellings, small commercial buildings, roads, streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

The Moko soil is in capability unit VIIs-4 and in woodland suitability group 5x3.

22—Noark very cherty silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on uplands. Slopes are smooth and convex. Individual areas range from about 10 to 80 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 10 inches. The subsoil is yellowish red very cherty silt loam to a depth of about 16 inches; below that, it is red very cherty silty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. The surface and subsurface layers are strongly acid to slightly acid, and the subsoil is very strongly acid or strongly acid. Permeability is moderate,

Figure 8.—Frequent flooding restricts the use of Melvin soils in most areas to permanent pasture or woodland.

and the available water capacity is low. Tilth is difficult to maintain because the many chert fragments make tillage difficult. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are small areas of soils that are similar to Noark soils except that they have cherty limestone or limestone bedrock at a depth of less than 60 inches. Also included are small areas of Estate, Portia, and Arkana soils.

This soil is moderately suited to cultivated crops. Suitable crops include corn and small grains. Runoff is medium and the hazard of erosion is severe if cultivated crops are grown. Under management that includes minimum tillage, contour cultivation, and terraces, crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for pasture and hay crops. It is well suited to use as pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza.

This soil is moderately suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and white oak. Seedling mortality is a moderate limitation to woodland use and management.

There are no significant limitations for dwellings and local roads and streets. Slope is a moderate limitation for small commercial buildings. This limitation generally can be overcome by good design and installation procedures. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation generally can be overcome by expanding the absorption field or by modifying the field itself.

This soil is in capability unit IIIe-3 and in woodland suitability group 4f8.

23—Noark very cherty silt loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil on hillsides. Slopes are smooth and convex. The individual areas range from about 20 to 100 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 10 inches. The subsoil is yellowish red very cherty silt loam to a depth of about 16 inches; below that, it is red very cherty silty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from strongly acid to slightly acid in the surface and subsurface layers and is very strongly acid or strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. The rooting zone is deep and can be easily penetrated by roots.

Included with this soil in mapping are small areas of soils that are similar to Noark soils but have cherty limestone or limestone bedrock at a depth of less than 60 inches. Also included are areas of Estate, Portia, and Moko soils.

This soil is not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard if cultivated crops are grown.

This soil is used mainly as woodland and pasture. It is moderately suited to use as pasture. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass.

This soil is moderately suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and white oak. Seedling mortality is a moderate limitation to woodland use and management.

Slope is a moderate limitation for dwellings and local roads and streets and a severe limitation for small commercial buildings. These limitations generally can be overcome by proper engineering design. Slope and the moderate permeability are moderate limitations for septic tank absorption fields. Expanding the absorption field or modifying the field itself can compensate for the moderate permeability.

This soil is in capability unit VIe-2 and in woodland suitability group 4f8.

24—Noark very cherty silt loam, 20 to 40 percent slopes. This is a deep, well drained, steep soil on hillsides. Slopes are smooth and convex. Individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 10 inches. The subsoil is yellowish red very cherty silt loam to a depth of about 16 inches; below that, it is red very cherty silty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from slightly acid to strongly acid in the surface and subsurface layers and is strongly acid or very strongly acid in the subsoil. Permeability is moderate, and the available water capacity is low. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are a few small areas of limestone outcrop and areas of soils that are similar to Noark soils except that they have limestone bedrock at a depth of less than 60 inches. Also included are a few small areas of Arkana, Estate, Moko, and Portia soils.

This soil is not suited to cultivated crops or to use as improved pasture. Runoff is rapid, and the hazard of erosion is very severe. This soil is better suited to use as woodland, wildlife habitat, or rangeland. Tame pasture plants are difficult to establish and maintain. The soil is mainly used as woodland of upland hardwoods and pines.

This soil is moderately suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and white oak. The hazard of erosion and seedling mortality are moderate limitations to woodland use and management, and restricted use of equipment is a severe limitation.

This soil has severe limitations for most urban uses. Steepness of slopes is a severe limitation for dwellings, small commercial buildings, roads and streets, and septic tank absorption fields. This limitation is difficult or impractical to overcome.

This soil is in capability unit VIIs-3 and in woodland suitability group 4f9.

25—Peridge silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on stream terraces and uplands. Slopes are smooth and convex. The individual areas are 10 to 60 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is yellowish red silt loam or silty clay loam to a depth of 34 inches; yellowish red, mottled silty clay loam to a depth of 50 inches; and red, mottled silty clay loam to a depth of 80 inches or more.

This soil is moderate in natural fertility and in content of organic matter. Reaction is medium acid or strongly acid throughout, except in the surface layer in areas where lime has been applied. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots.

Included with this soil in mapping are some areas of eroded soils in which mixing of the surface layer and the subsoil has taken place. Also included are small areas of Sturkie and Secesh soils.

This soil is moderately suited to cultivated crops. Suitable crops include corn, soybeans, and small grains. Runoff is medium, and erosion is a moderate hazard if cultivated crops are grown. Under management that includes minimum tillage, terraces, and contour cultivation, clean-tilled crops that leave large amounts of residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

The soil is mainly used as pasture and for hay crops. It is well suited to this use. Suitable pasture plants include alfalfa, bermudagrass, tall fescue, white clover, and lespedeza.

This soil is well suited to use as woodland. Suitable trees include loblolly pine, shortleaf, and red oak. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. There are no significant limitations for dwellings. Slope is a moderate limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. These limitations generally can be overcome by proper design and careful engineering and construction techniques. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation generally can be overcome by expanding the size of the absorption field or by modifying the field itself.

This soil is in capability unit IIIe-2 and in woodland suitability group 3o7.

26—Portia sandy loam, 3 to 8 percent slopes, eroded. This is a deep, well drained, gently sloping soil on uplands and foot slopes. Slopes are smooth and convex. The individual areas range from about 10 to 50 acres in size.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is dark brown loam to a depth of about 12 inches; reddish brown loam to a depth of about 30 inches; yellowish red loam to a depth of about 51 inches; red clay loam to a depth of about 63 inches; and red clay to a depth of 80 inches or more.

This soil is low in natural fertility and content of organic matter. Reaction ranges from strongly acid to slightly acid in the surface layer, very strongly acid to medium acid in the upper part of the subsoil, and strongly acid to medium acid in the lower part of the subsoil. Permeability is moderately slow, and the available water capacity is medium. This soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots.

Sheet and rill erosion have reduced the thickness of the surface layer in most areas and exposed the subsoil in some places. In some places, plowing has mixed the surface layer with subsoil. A few areas are gullied; the gullies are 10 feet or more deep and 50 to 100 feet wide. These areas are generally difficult to reclaim and require major conservation treatment.

Included with this soil in mapping are areas of soils that are stony or gravelly. Also included are small areas of Boden, Brockwell, and Estate soils.

This soil is moderately suited to cultivated crops. Suitable crops include corn, small grains, and truck crops. Runoff is medium, and erosion is a severe hazard if cultivated crops are grown. Under management that includes minimum tillage, contour cultivation, and terraces, crops that leave large amounts or residue can be safely grown year after year. Conservation measures need to be intensified as slope length and gradient increase.

This soil is mainly used for pasture or hay (fig. 9). It is well suited to use as pasture. Suitable pasture plants include tall fescue, white clover, bahiagrass, bermudagrass, and lespedeza.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, white oak, red oak, and sweetgum. There are no significant limitations to woodland use and management.

This soil is moderately suited to most urban uses. There are no significant limitations for dwellings. Slope is a moderate limitation for small commercial buildings. Low strength is a moderate limitation for local roads and streets. These limitations generally can be overcome by good engineering design and installation procedures. The moderately slow permeability is a severe limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field or by modifying the field itself.

Figure 9.—Common bermudagrass on Portia sandy loam, 3 to 8 percent slopes, eroded. The soil is well suited to use as pasture.

This soil is in capability unit IIIe-1 and in woodland suitability group 3o7.

27—Portia sandy loam, 8 to 12 percent slopes, eroded. This is a deep, well drained, moderately sloping soil on upland foot slopes. Slopes are smooth and convex. The individual areas range from about 10 to 30 acres in size.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is dark brown loam to a depth of about 12 inches; reddish brown loam to a depth of about 30 inches; yellowish red loam to a depth of about 51 inches; red clay loam to a depth of about 63 inches; and red clay to a depth of 80 inches or more.

This soil is low in natural fertility and content of organic matter. Reaction ranges from strongly acid to slightly acid in the surface layer, very strongly acid to medium acid in the upper part of the subsoil, and strongly acid to medium acid in the lower part of the subsoil. Permeability is moderately slow, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots.

Sheet and rill erosion have reduced the thickness of the surface layer in most areas and exposed the subsoil in some places. Where this soil has been cultivated, plowing has mixed the surface layer with the subsoil. In a few areas there are gullies 10 feet or more deep and 50 to 100 feet wide. These areas are generally difficult to reclaim and require major conservation treatment.

Included with this soil in mapping are areas of soils that are stony and gravelly and small areas of Boden, Brockwell, and Estate soils.

This soil is poorly suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard if cultivated crops are grown. Under management that includes minimum tillage, terraces, and contour cultivation, sown crops can be grown occasionally in a cropping system that includes close-growing cover most of the time. Conservation measures need to be intensified as slope length and gradient increase.

This soil is used mainly for pasture and hay crops. It is well suited to use as pasture. Suitable pasture plants include tall fescue, white clover, lespedeza, bahiagrass, and bermudagrass.

This soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, red oak, and

sweetgum. There are no significant limitations to woodland use and management.

Slope is a moderate limitation for dwellings. Slope and low strength are moderate limitations for local roads and streets. Slope is a severe limitation for small commercial buildings. These limitations can be overcome by good engineering design and construction. The moderately slow permeability is a severe limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field or by modifying the field itself.

This soil is in capability unit IVe-1 and in woodland suitability group 3o7.

28—Ramsey-Rock outcrop complex, 3 to 15 percent slopes. This complex consists of small areas of Ramsey soils and Rock outcrop on upland ridges and side slopes. The areas are so intermingled that it was not practical to map them separately at the scale selected for mapping. The individual areas of each of the components of the complex are 1 to 3 acres in size, and the mapped areas are about 5 to 60 acres in size.

Ramsey soils make up about 60 percent of each mapped area. Typically, the surface layer is dark brown stony sandy loam about 1 inch thick. The subsurface layer is brown stony sandy loam to a depth of about 6 inches. The subsoil is yellowish brown stony sandy loam to a depth of about 16 inches. Bedrock, directly underlying the subsoil, is hard, level-bedded, acid sandstone.

This soil is low in natural fertility and moderate in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is rapid, and the available water capacity is very low.

Rock outcrop makes up about 25 percent of each mapped area. Typically, it is hard, acid sandstone bedrock.

The remaining 15 percent of this complex consists of soils that are 2 to 7 inches thick and lack genetic horizonation but are similar to Ramsey soils in behavior. These soils are capable of supporting some grasses, shrubs, and trees. Also included are small areas of stony Estate, Brockwell, and Portia soils and soils in areas of large, massive sandstone boulders 5 to 30 feet in diameter.

The soils in this complex are not suited to cultivated crops or to use as improved pasture. Depth to bedrock, surface stones, and exposed bedrock limit the use of the soils to wildlife habitat, rangeland, woodland, or recreation. These soils should not be cleared. Erosion is a very severe hazard if the native vegetation is disturbed. The soils are mainly in woodland of scattered low-grade, scrub redcedar, pine, and hardwoods, with a sparse stand of native prairie plants, shrubs, lichens, mosses, and cacti and other succulents in the openings.

Ramsey soils are poorly suited to use as woodland. Adapted trees include shortleaf pine, loblolly pine, and redcedar. Restrictions on the use of equipment, seedling mortality, and the hazard of erosion are severe limitations to woodland use and management.

The soils in this complex are poorly suited to most urban uses. Shallowness to bedrock, surface stones, and the rock outcrops are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is a severe limitation for small commercial buildings. These limitations are difficult and generally impractical to overcome.

Ramsey soils are in capability unit VIIs-4 and in woodland suitability unit 5x9.

29—Ramsey-Rock outcrop complex, 15 to 40 percent slopes. This complex consists of Ramsey soils and Rock outcrop on upland ridges and side slopes. The areas are small and so intermingled that they could not be mapped separately at the scale selected for mapping. The individual areas of each of the components of the complex are 1 to 3 acres in size, and the mapped areas are about 20 to 60 acres in size.

Ramsey soils make up about 60 percent of each mapped area. Typically, the surface layer is dark brown stony sandy loam about 1 inch thick. The subsurface layer is brown stony sandy loam to a depth of about 6 inches. The subsoil is yellowish brown stony sandy loam to a depth of about 13 inches. Bedrock, directly underlying the subsoil, is hard, level-bedded, acid sandstone.

This soil is low in natural fertility and moderate in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is rapid, and the available water capacity is very low.

Rock outcrop makes up about 25 percent of each mapped area. Typically, it is hard, acid sandstone bedrock.

The remaining 15 percent of this complex consists of soils that are 2 to 7 inches thick and lack genetic horizonation but are similar to Ramsey soils in behavior. These soils are capable of supporting some grasses, shrubs, and trees. Also included are small areas of stony Estate soils, soils in areas of large, massive sandstone boulders 5 to 30 feet in diameter, and areas of soils that have slopes of more than 40 percent.

The soils in this complex are not suited to cultivated crops or to use as improved pasture. Shallowness to bedrock, surface stones, and rock outcrops limit the use of the soils to wildlife habitat, rangeland, woodland, or recreation. These soils should not be cleared. The hazard of erosion is very severe if the native vegetation is disturbed. The soils are mainly in woodland of scattered low-grade scrub redcedar, pine, and hardwoods, with a sparse stand of native prairie plants, shrubs, lichens, mosses, and cacti and other succulents in the openings.

Ramsey soils are poorly suited to use as woodland. Adapted trees include shortleaf pine, loblolly pine, and redcedar. Restrictions on the use of equipment, seedling mortality, and the hazard of erosion are severe limitations to woodland use and management.

The soils in this complex are poorly suited to most urban uses. Shallowness to bedrock, slope, surface stones, and rock outcrops are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult and generally impractical to overcome.

Ramsey soils are in capability unit VIIs-4 and in woodland suitability group 5x9.

30—Secesh and Elsah soils, frequently flooded. This map unit consists of deep, well drained and somewhat excessively drained, level to nearly level soils in an irregular pattern on flood plains along small streams. Individual areas of each soil are long and narrow and large enough to be mapped separately, but because of present and predicted use, the soils were mapped together. Most mapped areas consist of both soils, but a few areas consist of only one soil. The mapped areas range from about 10 to 100 acres in size. Slopes range from 0 to 3 percent.

These soils formed in alluvial sediment that washed mainly from cherty dolomite and siltstone. The soils are usually flooded two or three times each year for brief periods late in winter and early in spring.

Secesh soils are well drained. They make up about 55 percent of the map unit. Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is dark yellowish brown loam to a depth of about 12 inches; strong brown cherty silty clay loam to a depth of about 30 inches; yellowish red very cherty sandy clay loam to a depth of about 55 inches; and strong brown very cherty sandy clay loam to a depth of 76 inches or more.

Secesh soils are moderate in natural fertility and in content of organic matter. Permeability is moderate, and the available water capacity is medium. Reaction is medium acid or slightly acid in the surface layer and very acid to slightly acid in the subsoil. The rooting zone is deep and easily penetrated by roots.

Elsah soils are somewhat excessively drained. They make up 30 percent of this map unit. Typically, the surface layer is very dark grayish brown cherty loam about 8 inches thick. The underlying material is dark brown very cherty loam to a depth of about 28 inches, dark yellowish brown very cherty silt loam to a depth of about 40 inches, and dark brown and brown very cherty loam to a depth of about 72 inches. Bedrock is hard, level-bedded dolomite.

Elsah soils are moderate in natural fertility and in content of organic matter. Permeability is moderately rapid, and the available water capacity is low. Reaction ranges from medium acid to neutral throughout. The rooting zone is deep and easily penetrated by roots.

The remaining 15 percent of this map unit is made up of small areas of Peridge and Sturkie soils, gravel bars, and narrow overflow channels.

These soils are not suited to cultivated crops because of frequent flooding (fig. 10). In most areas, the soils have been cleared and are used as pasture or hay meadows. These soils are well suited to use as improved pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, alfalfa, and lespedeza.

Secesh soils are moderately suited to use as woodland, and Elsah soils are well suited. Suitable trees include black walnut, American sycamore, sweetgum, and eastern cottonwood. Secesh soils have no significant limitations to woodland use and management. Seedling mortality is a moderate limitation on Elsah soils.

Secesh and Elsah soils have severe limitations for most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Major flood control measures are needed to overcome this limitation.

This map unit is in capability unit Vw-2; Secesh soils are in woodland suitability group 4o7, and Elsah soils are in woodland suitability group 3f5.

31—Sturkie silt loam, occasionally flooded. This is a deep, well drained, nearly level soil on flood plains of the White River. Slopes are smooth and convex. The areas are long and narrow; most are less than 1/4 mile wide and are parallel to the river. Some areas have a series of low terraces on two or more levels. Slope is 1 to 3 percent. The individual areas range from about 40 to 200 acres in size. Some areas of this soil are protected against flooding by upstream dams.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is very dark grayish brown silt loam to a depth of about 28 inches. The subsoil is brown silt loam to a depth of about 46 inches; below that, it is dark brown silt loam to a depth of about 57 inches. The underlying material is dark brown silt loam to a depth of about 70 inches and brown loam to a depth of 80 inches or more.

This soil is moderate to high in natural fertility and in content of organic matter. The surface and subsurface layers range from medium acid to mildly alkaline, and the subsoil and substratum range from slightly acid to moderately alkaline. Permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots. Small streams that transect the areas entrench themselves very deeply in this soil and are difficult to cross with farm machinery. At intervals averaging more than 2 years, this soil is flooded for brief periods between December and April.

Included with this soil in mapping are small areas of Secesh and Peridge soils and areas of soils that have a surface layer of loam or fine sandy loam or a gravelly surface layer. Also included along intersecting tributaries are areas of soils that have slopes of more than 3 percent.

This soil is well suited to cultivated crops. Runoff is slow, and flooding is a moderate hazard. Suitable crops

Figure 10.—Secesh and Elsah soils are on narrow flood plains. Frequent flooding restricts their use to permanent pasture.

include soybeans, corn, and small grains. With good management, clean-tilled crops that leave large amounts of residue can be grown safely year after year. Conservation measures need to be intensified as slope length and gradient increase. This soil is used mainly for hay or pasture. This soil is well suited to use as pasture. Suitable pasture plants include alfalfa, tall fescue, white clover, bermudagrass, orchardgrass, and lespedeza.

This soil is well suited to use as woodland. Suitable trees include red oak, white oak, American sycamore, eastern cottonwood, and black walnut. There are no significant limitations to woodland use and management.

This soil has severe limitations for most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Some areas of this soil are protected from flooding by upstream dams. However, the possibility of flooding increases with the distance from these structures and with the number of tributaries that flow into the White River. Therefore, the hazard of flooding increases as the White River flows eastward along the western and southern boundaries of Izard County.

This soil is in capability unit IIw-1 and in woodland suitability group 2o4.

32—Sturkie silt loam, frequently flooded. This is a deep, well drained, nearly level soil on flood plains of larger streams. Slopes are smooth and convex. Some areas have a series of terraces on two or more levels. Slope is 1 to 3 percent. Individual areas range from about 40 to 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is very dark grayish brown silt loam to a depth of about 28 inches. The subsoil is brown silt loam to a depth of about 46 inches and dark brown silt loam to a depth of about 57 inches. The underlying material is dark brown silt loam to a depth of about 70 inches and brown loam to a depth of 80 inches or more.

This soil is moderate to high in natural fertility and in content of organic matter. Reaction ranges from medium acid to mildly alkaline in the surface and subsurface layers and slightly acid to moderately alkaline in the subsoil and substratum. Permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and easily penetrated by roots. At least once in 2 years, this soil is flooded for brief periods between December and April.

Included with this soil in mapping are small areas of Secesh and Peridge soils and areas of soils that have a surface layer of loam or fine sandy loam or a gravelly surface layer. Also included along intersecting tributaries are areas of soils that have slopes of more than 3 percent.

This soil is poorly suited to cultivated crops because of frequent flooding. Planting is often delayed, and in some years crops are severely damaged or destroyed by floodwater. Under good management, short-season crops that leave large amounts of residue can be grown in most years. The main crops are soybeans and grain sorghum.

The soil is used mainly for pasture and hay crops. This soil is well suited to use as pasture. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover.

This soil is well suited to use as woodland. Suitable trees include eastern cottonwood, American sycamore, and black walnut. There are no significant limitations to woodland use and management.

This soil has severe limitations for most urban uses. Flooding is a severe limitation for dwellings, roads and streets, small commercial buildings, and septic tank absorption fields. This limitation can be overcome only by major flood control measures.

This soil is in capability unit IVw-1 and in woodland suitability group 2o4.

33—Wideman fine sand, frequently flooded. This is a deep, excessively drained, level to gently sloping soil on flood plains and natural levees. Slopes are 0 to 5 percent and are smooth and undulating. Individual areas are long and narrow and range from about 5 to 40 acres in size.

Typically, the surface layer is dark brown fine sand about 1 inch thick. The subsurface layer is yellowish brown fine sand to a depth of about 6 inches. The underlying material is dark yellowish brown loamy fine sand to a depth of about 11 inches; light yellowish brown fine sand to a depth of about 32 inches; brown fine sandy loam to a depth of about 38 inches; very pale brown fine sand to a depth of about 48 inches; dark grayish brown fine sandy loam to a depth of about 52 inches; very pale brown fine sand to a depth of about 63 inches; dark grayish brown loamy fine sand to a depth of about 72 inches; and yellowish brown fine sandy loam to a depth of 80 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from extremely acid to medium acid in the surface and subsurface layers and strongly acid to neutral in the underlying layers. Permeability is moderately rapid, and the available water capacity is low. This soil can be worked within a wide range of moisture content. The root zone is deep and easily penetrated by roots. This soil is droughty in summer. In most areas, this soil is flooded early in spring in most years. It is flooded for very brief periods by fast-moving water, which can cause severe damage in a short time.

Included with this soil in mapping are small areas of Hontas and Melvin soils and areas of soils that have a surface layer of loamy sand or fine sandy loam. also included are narrow overflow channels and gravel bars.

This soil is not suited to cultivated crops. The hazard of flooding and the low available water capacity severely limit its use for crop production.

This soil is used mainly for hay or as improved pasture. This soil is moderately suited to use as pasture. Suitable pasture plants include bermudagrass, lespedeza, alfalfa, tall fescue, and white clover.

This soil is well suited to use as woodland. Suitable trees include loblolly and shortleaf pines, sweetgum, cottonwood, and sycamore. Restrictions on the use of equipment and seedling mortality are moderate limitations to woodland use and management.

This soil has severe limitations for most urban uses. Flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Major flood control measures are needed to overcome this limitation.

This soil is in capability unit Vw-3 and in woodland suitability group 3s8.

prime farmland

Prime farmland, as defined by the United States Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. The soils that make up prime farmland have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be long enough. Prime farmland produces the highest yields with minimal input of energy and economic resources, and using prime farmland for farming results in the least damage to the environment.

Prime farmland may now be cropland, pasture, woodland, or land in other uses but not urban and built-up land or water areas. It is either used for producing food or fiber or is available for these uses.

On prime farmland, the moisture supply from precipitation or irrigation is adequate and dependable. The temperature and growing season are favorable, and

the acidity or alkalinity of the soils is acceptable. There are few or no rocks. The soils are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. Detailed information on the criteria for prime farmland can be obtained from the local office of the Soil Conservation Service.

In Fulton County, no land meets the requirements for prime farmland. In Izard County, about 18,500 acres, making up about 5 percent of the county, is prime farmland. The areas are scattered throughout Izard County but are mostly in the central part of the county or parallel to the White River along the southern border. The soils making up prime farmland are mainly in map units 3 and 5 on the general soil map. Most of the acreage is used for pasture and hay crops. A small amount is used for row crops.

A recent trend in Izard County has been the conversion of some prime farmland to industrial and urban uses. The loss of prime farmland puts pressure on marginal land, which generally is less productive because it is more erodible, droughty, and difficult to cultivate.

The following map units, or soils, make up prime farmland in Izard County.

26—Portia sandy loam, 3 to 8 percent slopes, eroded
31—Sturkie silt loam, occasionally flooded

The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 6. The soil qualities that affect use and management are described in the section "Detailed soil map units." This list does not constitute a recommendation for a particular land use.

Prime farmland excludes urban and built-up areas. Urban and built-up areas are defined as continuous areas 10 acres or more in size that are used as housing, industrial, or commercial sites, sites for institutions or public buildings, railroad yards, small parks, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, and water control structures.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 224,000 acres in the survey area was used for crops and pasture in 1974, according to the Census of Agriculture of that year. Of that acreage, about 24,000 acres was harvested cropland and 124,000 acres was cropland that was used for pasture. In addition, approximately 76,000 acres was improved and unimproved pasture and rangeland. Approximately 60,000 acres of wooded pasture was not included in the above total.

Most cleared land in Fulton and Izard Counties is presently used for pasture and hay production. Only a small acreage is used for clean-tilled row crops. Soils that are well suited to row crops are restricted to bottoms and terraces along the White River, terraces above flood plains along smaller streams, and a few small, gently sloping upland areas. Field crops suited to these areas are soybeans, corn, and small grains.

Some gently sloping to moderately sloping upland soils are moderately suited or well suited to drilled or sown crops, for example, oats, wheat, and grain sorghum.

Most soils in Fulton and Izard Counties are poorly suited or not suited to intensive farm use because of surface stones, slope, shallowness to bedrock, many coarse fragments in the soil, or a combination of these features.

Contour cultivation, grassed waterways, and terraces are needed on sloping soils that are used for tilled crops. Annual cover crops or grasses and legumes should be grown regularly in the cropping system if erosion is a severe or very severe hazard.

If left bare, most of the soils tend to pack and crust over after heavy rains. Cover crops and crop residue help to maintain good tilth. The crop residue should be shredded and spread evenly to provide protective cover and add organic matter to the soil. Minimum tillage should be practiced to the extent practical for the soil conditions and the needs of the crop.

In general, the upland soils in Fulton and Izard Counties are low in nitrogen, potassium, phosphorus, calcium, and organic matter. The kind and amount of fertilizer applied are generally based on soil tests, the kinds of crops to be grown, past experience, the productive potential of the soil, and expected yields. On

most soils, periodic applications of lime as indicated by soil tests are helpful to most crops and are generally necessary for satisfactory production of such crops as alfalfa, white clover, red clover, and vegetables and other specialty crops.

Small acreages are in commercial and home orchards and home gardens. Although the cash income from these enterprises is small, they are important. Most farm families and many urban families put up and freeze home-grown fruit and vegetables for home use. Specialty crops, such as watermelons, strawberries, tomatoes, and sweet corn, are grown for cash sales at local farmers' markets.

Perennial grasses or mixtures of grasses and legumes are grown for pasture and hay. Mixtures generally consist of either a warm-season or a cool-season perennial grass and a suitable legume.

Tall fescue is the pasture grass most commonly grown in the survey area. It is a cool-season perennial propagated by seeding, generally in the fall. Common bermudagrass, hybrid bermudagrasses, and lovegrass are also grown. These are warm-season perennials, propagated in the spring by either seeding or sprigging. The bermudagrasses are generally sprigged because stands started by seeding are more susceptible to winterkill. Red clover and white clover are the most commonly grown legumes. Alfalfa is suited to the fertile, well drained Sturkie and Peridge soils on bottomlands and terraces along the White River.

Pasture management aims at producing high-quality forage, maintaining vigorous, permanent stands of pasture plants, and controlling erosion. Rotation grazing and renovation are important for these purposes. Proper grazing use also requires restricted grazing of tall fescue and other cool-season grasses during their summer dormant period. Brush control is essential, and weed control is generally needed.

Pasture grasses respond well to nitrogen fertilizer. Grass and legume mixtures may require phosphate and potash fertilizers and agricultural lime at rates based on soil tests.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-2.

The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Paul I. Brown, forester, Soil Conservation Service, helped prepare this section.

The soils of Fulton and Izard Counties were originally covered by interspersed forest and savannas. There were scattered prairies on some of the nearly level to gently sloping soils. Settlers in this area converted many wooded tracts and savannas to cropland or grassland; but from about 1930 on, much idle land was allowed to revert to forest. A forest survey conducted by the Forest Service, U.S. Department of Agriculture, in 1949 indicated that 58 percent of the area was forested (*9*). A subsequent survey indicated that forested acreage had increased to about 65 percent of the total acreage by 1969 (*11*). Since then, the conversion of forest land to pasture has again been on an upswing. An unpublished survey conducted by the Soil Conservation Service in 1978 indicated that about 53 percent of the land area, or 404,305 acres, was forested. The estimated net annual growth for all tree species in Fulton and Izard Counties is 7.6 million cubic feet (*11*).

Stands of commercial trees in the survey area vary in quality from good to poor. The better stands generally are on deep soils and on moderately deep soils on north-facing slopes. Broad-leaved trees predominate in the forests; however, there are also scattered stands of conifers.

The economic impact of wood products in the survey area is small, mainly because of the conversion of forest land to pasture and the low priority accorded to the remaining woodland. Wood products of the area include lumber for furniture, railroad ties, fenceposts, handle stock, and fuelwood. The area does, however, benefit significantly from the esthetic and recreational values of its forest land. Other uses include grazing and wildlife habitat, and forest land also contributes to soil and water conservation.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the woodland suitability group for each soil. Soils assigned to the same woodland suitability group require the same general management and have about the same potential productivity.

The first part of the designation for a *woodland suitability group*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the designation, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

The third part of the designation, a number, indicates the kind of trees for which the soils in the group are best suited and also indicates the severity of the hazard or limitation. The numbers 1, 2, and 3 indicate slight, moderate, and severe limitations, respectively, and suitability for needle-leaved trees. The numbers 4, 5, and 6 indicate slight, moderate, and severe limitations, respectively, and suitability for broad-leaved trees. The numbers 7, 8, and 9 indicate slight, moderate, and severe limitations, respectively, and suitability for needle-leaved and broad-leaved trees.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use

of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. In table 8, the site index for eastern cottonwood was determined using 30 years of age, for American sycamore using 35 years of age, and for all other species using 50 years of age. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

wildlife habitat

Paul M. Brady, biologist, and Stephen A. Sewell, soil conservationist, Soil Conservation Service, helped prepare this section.

Fulton and Izard Counties are largely rural environments with clean, pleasant scenery and good wildlife habitat in predominantly pastoral and woodland settings.

About 53 percent of the survey area, or 404,305 acres, is forested; the rest is mainly pastureland. Forests in these counties are about 80 percent hardwoods (oak-hickory climax on uplands; oak-gum climax on lowlands) and about 20 percent pine.

Plants of major importance to terrestrial wildlife include woolly croton, greenbrier, bush and annual lespedezas, milk pea, panicgrass, partridgepea, paspalum, ragweeds,

tickclover, sumac, and vetches. Overstory and understory woody plants of importance are sweetgum, pine (for seeds), oaks, hackberry, elderberry, hickory, and dogwood. Domestic species of importance to wildlife include all pasture plants, especially alfalfa, fescue, and johnsongrass.

The abundant hardwood forests, interspersed pastures, numerous edges, and second-growth woodlots provide plentiful habitat for white-tailed deer, squirrels, raccoons, coyotes, opossums, foxes, a multitude of non-game birds, and other wildlife. Fox squirrels, rabbits, and other small-game animals have been slowly decreasing in number in recent years as small crop fields have been converted to pasture and woodland. This trend, however, has enabled deer and wild turkey populations to increase dramatically as woodland acreage increased. Restocking efforts, strict law enforcement, and better distribution of water have also been important factors in the increase of deer and turkey populations.

Bobwhite quail populations are exceptionally large in the survey area. Unmanaged pastures, old fields, and thinned woodlots produce numerous native woody and herbaceous plants that are important as food and cover for quail as well as for white-tailed deer, rabbits, and other wildlife.

Lowland habitats support a variety of furbearers, including muskrat, beaver, mink, raccoon, gray fox, striped skunk, and coyote.

Aquatic habitats are abundant. Fulton County has about 3,519 ponds, 117 miles of streams, and about 800 acres in lakes and reservoirs. Izard County has about 2,700 ponds, 214 miles of streams, and 1,025 acres in lakes and reservoirs. Largemouth bass, spotted bass, rock bass, smallmouth bass, white bass, rainbow trout, black crappie, white crappie, blue catfish, channel catfish, flathead catfish, bullheads, green sunfish, bluegill, longear sunfish, and redear sunfish are common in the water areas.

Fish farms are increasing in the survey area. A survey in October 1978 listed 400 acres in commercial food or baitfish production in Fulton County and none in Izard County.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness.

Examples of coniferous plants are pine, redcedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

James L. Janski, assistant state conservation engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning,

design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level

of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain

sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across

a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (*8*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 20.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the

soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone. Only saturated zones within a depth of about 6 feet are indicated.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

physical and chemical analyses of selected soils

The results of physical analysis of several typical pedons in the survey area are given in table 18 and the results of chemical analysis in table 19. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil series and their morphology." Soil samples were analyzed by the University of Arkansas in Fayetteville.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are given in the following paragraphs.

Silt and clay particle size distribution was determined by the hydrometer method (*5*). Sands were measured by sieving (*10*).

Organic carbon in the Brockwell and Wideman samples and Moko sample S75AR049-1 was determined by the dry combustion method, which gravimetrically measures the carbon evolved as carbon dioxide (*10*). The percentage of organic matter was then determined by multiplying the percentage of organic carbon by 1.72. Organic matter in the Sturkie sample, Moko sample S69AR025-3, and Moko sample S72AR033-2 was determined by the modified Walkley-Black method. The organic matter is digested with potassium dichromate-sulfuric acid, and the quantity of chromic acid that is reduced is measured colorimetrically.

Soil reaction was determined on a 1:1 soil to water mixture.

The bases were extracted with 1N, pH 7.0, ammonium acetate. Calcium, potassium, and sodium were determined with a flame-photometer and magnesium was measured by atomic absorption. The extractable acidity was determined by the barium chloride-triethanolamine method (*10*).

The total of the extractable calcium, potassium, magnesium, sodium, and extractable acidity is an approximation of the cation exchange capacity of the soil. Except in soils that contain soluble salts, base saturation was determined by dividing this total into the sum of calcium, potassium, magnesium, and sodium, and multiplying by 100.

engineering index test data

Table 20 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Arkansas State Highway Department.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*12*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 21, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water (i.e. wetness), plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning deposited by floods or streams, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, nonacid, mesic Typic Fluvaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*8*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*12*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Agnos series

The Agnos series consists of deep, well drained, very slowly permeable soils that formed in clayey residuum of weathered siltstone or dolomite bedrock. These are gently sloping to moderately steep soils on uplands. Slopes are 3 to 20 percent.

Agnos soils are geographically associated with Arkana, Captina, Doniphan, Elsah, Gassville, Gepp, Moko, and Secesh soils. Arkana soils are on lower landscapes, are less than 40 inches deep to bedrock, and have more than 35 percent base saturation. Captina soils are on

broad, gently sloping uplands, have a fragipan, and are more than 60 inches deep to bedrock. Doniphan soils are more than 60 inches deep to bedrock and have a redder subsoil. Elsah soils are on narrow flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Gassville soils are on higher positions on uplands and have a redder subsoil. Gepp soils have a redder subsoil and more than 35 percent base saturation. Moko soils are on lower landscapes, are less than 20 inches deep to bedrock, and have a loamy-skeletal control section. Secesh soils are on narrow flood plains and have a fine-loamy control section and more than 35 percent base saturation.

Typical pedon of Agnos very cherty silt loam, 3 to 8 percent slopes, in a moist wooded area in the SE1/4SE1/4NE1/4 sec. 19. T. 20 N., R. 8 W., Fulton County:

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; moderate fine granular structure; friable; many fine and medium roots; 40 percent, by volume, angular fragments of chert 2mm to 76mm in size; strongly acid; abrupt smooth boundary.

A2—2 to 10 inches; pale brown (10YR 6/3) cherty silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; common fine and medium pores; 30 percent, by volume, angular fragments of chert 2mm to 76mm in size; strongly acid; clear smooth boundary.

B21t—10 to 19 inches; strong brown (7.5YR 5/8) clay; moderate medium angular blocky structure; very firm; common fine and medium roots; common fine pores; many patchy thin clay films on faces of peds; 10 percent, by volume, angular fragments of chert 2mm to 76mm in size; very strongly acid; clear smooth boundary.

B22t—19 to 34 inches; strong brown (7.5YR 5/8) clay; common medium distinct very pale brown (10YR 7/3) mottles; moderate medium angular blocky structure; very firm; common fine and medium roots; few fine pores; many patchy thin clay films on faces of peds; 5 percent, by volume, angular fragments of chert 2mm to 76mm in size; very strongly acid; gradual wavy boundary.

B23t—34 to 42 inches; yellowish brown (10YR 5/6) clay; common medium prominent light gray (10YR 7/2) and red (2.5YR 4/6) mottles; strong medium angular blocky structure; very firm; few fine roots; many patchy thick clay films on faces of peds and on siltstone fragments; 10 percent, by volume, fragments of soft siltstone 2mm to 76mm in size; very strongly acid; gradual wavy boundary.

B24t—42 to 57 inches; ped interiors are mottled brownish yellow (10YR 6/8) and light brownish gray (10YR 6/2) clay and ped exteriors are light olive gray (5Y 6/2) clay; common medium prominent yellowish brown (10YR 5/4) mottles; moderate coarse platy structure parting to moderate medium angular blocky; very firm; few fine roots; common patchy thin clay films on faces of peds and on siltstone fragments; 10 percent, by volume, fragments of soft siltstone 2mm to 76mm in size; very strongly acid; clear wavy boundary.

Cr—57 to 72 inches; strong brown (7.5YR 5/6) (interior) and light olive gray (5Y 6/2) (exterior) soft, shaly siltstone; platy and angular blocky rock structure; extremely firm; very strongly acid.

The solum is 40 to 60 inches thick. The depth to soft siltstone ranges from 40 to 60 inches, and the depth to hard bedrock ranges from 60 to 72 inches. Reaction ranges from slightly acid to strongly acid in the A horizon and strongly acid to extremely acid in the B and C horizons.

The A horizon is 7 to 14 inches thick. The content of chert ranges from 35 to 70 percent. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3.

The B21t horizon has hue of 10YR, value of 5, and chroma of 4 or 6, or hue of 7.5YR, value of 5, and chroma of 6 or 8. The content of chert ranges from 0 to 15 percent. The B22t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8. The content of chert ranges from 0 to 5 percent. The B23t and B24t horizons have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4, 6, or 8, with mottles or mottled in shades of red, brown, gray, or olive. The content of chert ranges from 0 to 15 percent. The upper part of the B horizon is clay and the lower part is clay or silty clay.

The Cr horizon, if present, is weathered siltstone that has cracks and cavities filled with clay mottled in shades of red, brown, gray, or olive.

Arkana series

The Arkana series consists of moderately deep, well drained, very slowly permeable soils that formed in clayey residuum of weathered cherty dolomite or limestone bedrock. These are gently sloping to steep soils on uplands and side slopes. Slopes are 3 to 30 percent.

Arkana soils are geographically associated with Agnos, Doniphan, Elsah, Gassville, Gepp, Moko, Noark, and Secesh soils. Agnos soils are on higher landscapes, are more than 40 inches deep to bedrock, and have less than 35 percent base saturation. Doniphan soils are on higher landscapes, are more than 60 inches deep to bedrock, and do not have a mollic epipedon. Elsah soils are on narrow flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Gassville soils are on higher landscapes, have less than 35 percent base saturation, and do not have a mollic epipedon. Gepp soils are on higher landscapes, are more than 60 inches deep to bedrock, and do not have

a mollic epipedon. Moko soils are less than 20 inches deep to bedrock and do not have an argillic horizon. Noark soils are on ridges and side slopes at a higher elevation, have a clayey-skeletal control section, and are more than 60 inches deep to bedrock. Secesh soils are on narrow flood plains and have a fine-loamy control section and siliceous mineralogy.

Typical pedon of Arkana very cherty silt loam, in an area of Arkana-Moko complex, 3 to 8 percent slopes, in a moist wooded area in the NE1/4SE1/4SW1/4 sec. 2. T. 19 N., R. 7 W., Fulton County:

O1—1 inch to 0; hardwood leaves and twigs.
A11—0 to 2 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; moderate medium granular structure; very friable; many fine and medium roots; common fine pores; 40 percent, by volume, fragments of chert; mildly alkaline; clear smooth boundary.
A12—2 to 7 inches; dark brown (10YR 3/3) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; common fine pores; 35 percent, by volume, fragments of chert; mildly alkaline; abrupt smooth boundary.
A2—7 to 10 inches; brown (10YR 4/3) very cherty silt loam; weak medium granular structure; friable; many fine and medium roots; common fine pores; 35 percent, by volume, fragments of chert; medium acid; clear smooth boundary.
B21t—10 to 16 inches; yellowish red (5YR 4/6) very cherty silty clay; weak medium subangular structure; firm; thin patchy clay films; few fine and medium roots; common fine tubular pores; 50 percent, by volume, fragments of chert; strongly acid; clear smooth boundary.
B22t—16 to 21 inches; yellowish red (5YR 5/6) cherty clay; few fine faint yellowish brown motles; moderate fine subangular blocky structure; firm; plastic; 20 percent, by volume, fragments of chert; few fine black concretions; thin continuous clay films; few fine roots; few fine tubular pores; medium acid; gradual smooth boundary.
B23t—21 to 28 inches; dark yellowish brown (10YR 4/4) clay; weak coarse angular blocky structure; very firm; plastic; thick continuous clay films; few medium roots; few fine pores; 10 percent, by volume, fragments of chert; few fine black concretions; moderately alkaline; abrupt smooth boundary.
R—28 to 30 inches; hard, level-bedded dolomite bedrock.

The solum is 20 to 40 inches thick. Depth to bedrock ranges from 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline in the A horizon and from strongly acid to moderately alkaline in the B horizon.

The A1 horizon is 5 to 9 inches thick. The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1, 2, or 3. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The content of coarse fragments ranges from 35 to 60 percent in the A1 and A2 horizons.

The B1 horizon, if present, has hue of 7.5YR, value of 5, and chroma of 4 or 6, or hue of 5YR, value of 4 or 5, and chroma of 4 or 6. It is very cherty silty clay loam or very cherty silt loam. The B21t and B22t horizons have matrix colors in hue of 7.5YR and either value of 4 and chroma of 4 or value of 5 and chroma of 4, 6, or 8; or they have hue of 5YR and either value of 4 and chroma of 4 or 6 or value of 5 and chroma of 4, 6, or 8. The B23t horizon has matrix colors in hue of 10YR and either value of 4 and chroma of 4 or 6 or value of 5 and chroma of 4, 6, or 8; or it has hue of 7.5YR and either value of 4 and chroma of 4 or value of 5 and chroma of 4, 6, or 8. The B21t horizon is silty clay or clay or their cherty or very cherty analogs. The content of coarse fragments ranges from 10 to 60 percent. The B22t and B23t horizons are clay or cherty clay. The content of coarse fragments ranges from 0 to 35 percent. The B22t and B23t horizons commonly have mottles or relict fragments of bedrock in shades of brown or yellow.

The R horizon is hard, level-bedded dolomite or limestone bedrock.

Boden series

The Boden series consists of deep, well drained, moderately slowly permeable soils that formed in residuum of weathered sandstone and minor amounts of siltstone. These are gently sloping to moderately steep soils on uplands. Slopes are 3 to 20 percent.

Boden soils are geographically associated with Brockwell, Hontas, Melvin, Portia, and Wideman soils. Brockwell soils have a coarse-loamy control section and are more than 60 inches deep to bedrock. Hontas and Melvin soils are on flood plains, have a fine-silty control section, and are more than 60 inches deep to bedrock. Portia soils have a fine-loamy control section and are more than 60 inches deep to bedrock. Wideman soils are on flood plains, have a sandy control section, and do not have an argillic horizon.

Typical pedon of Boden gravelly sandy loam, 3 to 8 percent slopes, in a wooded area in the SE1/4NW1/4NE1/4 sec. 10, T. 18 N., R. 10 W., Izard County:

O1—1 inch to 0; partly decomposed leaves and twigs.
A1—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly sandy loam; moderate medium granular structure; very friable; many fine and medium roots; 15 percent, by volume, sandstone fragments; medium acid; clear smooth boundary.
A2—3 to 7 inches; brown (10YR 5/3) gravelly sandy loam; weak medium granular structure; very friable; many fine and medium roots; 15 percent, by volume, sandstone fragments; medium acid; clear smooth boundary.
B1—7 to 12 inches; yellowish red (5YR 5/8) sandy clay loam; weak medium subangular blocky structure;

friable; common fine and medium roots; thin patchy clay films on faces of peds; 5 percent, by volume, sandstone fragments; strongly acid; clear smooth boundary.

B21t—12 to 26 inches; red (2.5YR 4/6) sandy clay; moderate medium subangular blocky structure; firm; common fine and medium roots; thin continuous clay films on faces of peds; 5 percent, by volume, sandstone fragments; strongly acid; gradual smooth boundary.

B22t—26 to 38 inches; mottled, red (2.5YR 4/6) and strong brown (7.5YR 5/6) clay; moderate medium angular blocky structure; firm; common fine and medium roots; thin continuous clay films on faces of peds; strongly acid; gradual smooth boundary.

B23t—38 to 48 inches; mottled, red (2.5YR 4/6), strong brown (7.5YR 5/6), and grayish brown (10YR 5/2) clay; moderate medium angular blocky structure; firm; few fine and medium roots; thin continuous clay films on faces of peds; very strongly acid; abrupt smooth boundary.

Cr—48 to 50 inches; soft, level-bedded, weathered siltstone bedrock.

R—50 to 52 inches; sandstone bedrock.

The solum is 36 to 50 inches thick. Depth to bedrock ranges from 40 to 60 inches. Reaction is medium acid to very strongly acid in the A horizon and strongly acid or very strongly acid in the B and C horizons.

The A horizon is 6 to 11 inches thick. The A1 horizon has hue of 10YR with value of 4 and chroma of 2 or 3 or with value of 3 and chroma of 3. The A2 horizon has hue of 10YR with value of 5 and chroma of 3 or 4, or with value of 6 and chroma of 4. The content of sandstone fragments ranges from 15 to 25 percent, by volume.

The B1 horizon, if present, has hue of 5YR, value of 4 or 5, and chroma of 8, or it has hue of 7.5YR, value of 5, and chroma of 6 or 8. It is fine sandy loam or sandy clay loam. The content of sandstone fragments ranges from 0 to 10 percent. The B2t horizon has hue of 5YR and either value of 5 and chroma of 6 or 8 or value of 4 and chroma of 8; or it has hue of 2.5YR and either value of 4 and chroma of 6 or 8 or value of 5 and chroma of 8. The lower part of this horizon is mottled in shades of red and brown. The B2t horizon is sandy clay or clay. The content of sandstone fragments ranges from 0 to 10 percent, by volume.

The Cr horizon, if present, is soft, level-bedded, weathered siltstone or sandstone.

The R horizon is hard, level-bedded sandstone or siltstone bedrock.

Brockwell series

The Brockwell series consists of deep, well drained, moderately permeable soils that formed in loamy residuum of weathered sandstone. These are gently sloping to moderately steep soils on broad uplands and hillsides. Slopes are 3 to 20 percent.

Brockwell soils are geographically associated with Boden, Estate, Hontas, Melvin, Portia, Ramsey, and Wideman soils. Boden soils have a clayey control section and are less than 60 inches deep to bedrock. Estate soils are on uplands at a higher elevation and are less than 60 inches deep to bedrock. Hontas and Melvin soils are on flood plains and have a fine-silty control section. Hontas soils are moderately well drained, and Melvin soils are poorly drained. Portia soils have a fine-loamy control section and a redder subsoil than Brockwell soils have. Ramsey soils do not have an argillic horizon and are less than 20 inches deep to bedrock. Wideman soils are on flood plains, have a sandy control section, and do not have an argillic horizon.

Typical pedon of Brockwell fine sandy loam, 3 to 8 percent slopes, in the SW1/4SW1/4NW1/4 sec. 14, T. 18 N., R. 10 W., Izard County:

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine granular structure; very friable; common medium roots; very strongly acid; clear smooth boundary.

A2—6 to 12 inches; brown (10YR 5/3) sandy loam; weak fine granular structure; very friable; common medium roots; strongly acid; clear smooth boundary.

B1—12 to 17 inches; brown (7.5YR 5/4) sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; strongly acid; clear smooth boundary.

B21t—17 to 31 inches; strong brown (7.5YR 5/6) fine sandy loam; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; common fine and medium roots; strongly acid; gradual wavy boundary.

B22t—31 to 41 inches; strong brown (7.5YR 5/6) and pale brown (10YR 6/3) fine sandy loam; common medium distinct red (2.5YR 4/6) mottles; moderate medium subangular blocky; friable; thin patchy clay films on faces of peds; few fine roots; common fine vesicular pores; few pockets and vertical streaks of uncoated sand grains; strongly acid; gradual smooth boundary.

B23t—41 to 53 inches; strong brown (7.5YR 5/6) and pale brown (10YR 6/3) fine sandy loam; common medium prominent red (2.5YR 4/6) mottles; weak coarse subangular blocky structure; friable; thin continuous clay films on faces of peds and bridging sand grains; few fine roots; common fine vesicular pores; common pockets and vertical streaks of uncoated sand grains; strongly acid; gradual smooth boundary.

B24t—53 to 80 inches; mottled, yellowish red (5YR 4/6), brown (7.5YR 5/4), and red (2.5YR 4/6) sandy clay loam; weak coarse subangular blocky structure; firm; thin patchy clay films on faces of peds and bridging sand grains; few fine vesicular pores; 10 percent, by volume, 1/2-inch to 3-inch fragments of weathered sandstone; strongly acid.

The solum is 60 to more than 80 inches thick. Reaction is strongly acid or very strongly acid throughout. The content of gravel ranges from 0 to 35 percent throughout.

The A horizon is 4 to 16 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2, 3, or 4. Some pedons have an A1 horizon that has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The texture of the Ap and A1 horizons is fine sandy loam or gravelly sandy loam. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is fine sandy loam, sandy loam, and their gravelly analogs.

In some pedons there is a B1 horizon. It is 4 to 7 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 4 or 6, or it has hue of 7.5YR and either value of 4 and chroma of 4 or value of 5 and chroma of 4 or 6. The B1 horizon is fine sandy loam, sandy loam, loam, and their gravelly analogs. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 3, 4, or 6, or it has hue of 7.5YR, value of 5, and chroma of 6. It is fine sandy loam, sandy loam, sandy clay loam, and their gravelly analogs. The lower part of the B2t horizon is commonly mottled in shades of red and brown.

The B3 and C horizons, if present, have colors and textures similar to those of the B2t horizon.

Captina series

The Captina series consists of deep, moderately well drained, slowly permeable soils that formed in loamy material derived from weathered cherty limestone or cherty dolomite. These are gently sloping soils on broad uplands and stream terraces. Slope is 3 to 8 percent.

Captina soils are geographically associated with Agnos, Doniphan, Gassville, and Gepp soils. Agnos soils are less than 60 inches deep to bedrock, do not have a fragipan, and have a clayey control section. Doniphan and Gassville soils are on ridges and side slopes, do not have a fragipan, and have a clayey control section. Gepp soils are on ridges and side slopes, have a very-fine control section, and do not have a fragipan.

Typical pedon of Captina silt loam, 3 to 8 percent slopes, in a meadow, SE1/4NW1/4SE1/4 sec. 11, T. 18 N., R. 7 W., Izard County:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; many fine roots; approximately 5 percent, by volume, chert fragments; medium acid; abrupt smooth boundary.

B1—9 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; many fine and medium tubular pores; 5 percent, by volume, chert fragments; medium acid; clear smooth boundary.

B21t—13 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; many fine and medium tubular pores; 5 percent, by volume, chert fragments; strongly acid; clear wavy boundary.

Bx1—20 to 28 inches; strong brown (7.5YR 5/6) cherty silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium angular blocky structure; firm and brittle; thin continuous clay films on faces of peds and in pores; few fine roots in vertical seams; many fine vesicular pores; 15 percent, by volume, chert fragments; very strongly acid; gradual smooth boundary.

Bx2—28 to 46 inches; mottled, light gray (10YR 6/1) strong brown (7.5YR 5/8), yellowish red (5YR 5/8), and yellowish brown (10YR 5/4) very cherty silty clay loam; thick platy structure parting to moderate medium angular blocky; firm and brittle; thin continuous clay films on faces of peds and pore walls; few fine roots in vertical seams; many fine vesicular pores; 50 percent, by volume, chert fragments; very strongly acid; diffuse irregular boundary.

B22t—46 to 72 inches; red (2.5YR 4/6) cherty clay; common medium prominent gray (10YR 6/1) and common medium distinct strong brown (7.5YR 5/8) mottles; moderate fine angular blocky structure; firm; thick continuous clay films on faces of peds; few fine pores; 15 percent, by volume, chert fragments, and approximately 2 percent soft, weathered siltstone fragments; very strongly acid.

The solum is more than 72 inches thick. The depth to consolidated bedrock is more than 72 inches. The depth to the fragipan ranges from 16 to 30 inches. Reaction ranges from slightly acid to strongly acid in the A horizon and from strongly acid to extremely acid in the B horizon.

The A horizon is 5 to 10 inches thick. The Ap horizon has hue of 10YR with either value of 4 and chroma of 2 or 3 or value of 5 and chroma of 3 or 4.

The B1 horizon, if present, has hue of 10YR, or 7.5YR, value of 5, and chroma of 4, 6, or 8. The B21t horizon has hue of 10YR or 7.5YR, vlaue of 5, and chroma of 6 or 8. It is silt loam or silty clay loam. The content of chert above the fragipan ranges from 0 to 5 percent. The Bx horizon has hue of 10YR, value of 5, and chroma of 4 or 6; or it has hue of 7.5YR, value of 5, and chroma of 6 and mottles in shades of gray and yellowish red; or it is mottled in shades of gray, brown, and yellowish red. The texture of the fine earth is silt loam or silty clay loam. The upper part of the Bx horizon is 0 to 15 percent chert fragments, by volume, and the lower part is 0 to 75 percent chert fragments. The B22t horizon has hue of 5YR and either value of 4 and chroma of 6 or value of 5 and chroma of 6 or 8; or it has hue of 2.5YR and either value of 4 or 5 and chroma of 6 or 8 or value of 3 and chroma of 6. The B22t horizon is mottled in shades of gray and brown. The texture of the fine earth is silty clay or clay. The content of chert ranges from 5 to 25 percent.

Doniphan series

The Doniphan series consists of deep, well drained, moderately permeable soils that formed in clayey residuum of weathered cherty dolomite bedrock. These are gently sloping soils on uplands. The native vegetation is mixed low-grade upland hardwoods. Slope ranges from 3 to 8 percent.

Doniphan soils are geographically associated with Agnos, Arkana, Captina, Elsah, Gassville, Gepp, Moko, and Secesh soils. Agnos soils are less than 60 inches deep to bedrock and have a brown or yellowish brown subsoil. Arkana soils are at a slightly lower elevation, have bedrock at a depth of less than 40 inches, and have a mollic epipedon. Captina soils are on broad upland flats and have a fragipan and a fine-silty control section. Elsah soils are on narrow flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Gassville soils are less than 60 inches deep to bedrock. Gepp soils are at a slightly higher elevation and have a very-fine control section and more than 35 percent base saturation. Moko soils are at a lower elevation, are less than 20 inches deep to bedrock, and do not have an argillic horizon. Secesh soils are on narrow flood plains and have a fine-loamy control section and more than 35 percent base saturation.

Typical pedon of Doniphan very cherty silt loam, in an area of Gassville-Doniphan complex, 3 to 8 percent slopes, in a moist wooded area in the NW1/4NW1/4NE1/4 sec. 13, T. 20 N., R. 11 W., Fulton County:

A1—0 to 2 inches; dark brown (10YR 3/3) very cherty silt loam; weak fine granular structure; friable; many fine roots; 50 percent, by volume, chert fragments; medium acid; clear smooth boundary.

A2—2 to 8 inches; light yellowish brown (10YR 6/4) very cherty silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 50 percent, by volume, chert fragments; strongly acid; gradual wavy boundary.

B1—8 to 19 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; common fine pores; 35 percent, by volume, chert fragments; strongly acid; gradual smooth boundary.

B21t—19 to 30 inches; yellowish red (5YR 5/8) cherty silty clay; common medium faint red (2.5YR 4/6) and few medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; few medium roots; few fine pores; 25 percent, by volume, chert fragments; strongly acid; gradual smooth boundary.

B22t—30 to 55 inches; dark red (2.5YR 3/6) clay; common medium distinct strong brown (7.5YR 5/6) and common medium prominent light yellowish brown (10YR 6/4) mottles; moderate medium angular blocky structure; firm; thick continuous clay films on faces of peds; 5 percent, by volume, chert fragments; strongly acid; gradual wavy boundary.

B23t—55 to 72 inches; mottled, dark red (2.5YR 3/6), strong brown (7.5YR 5/6), and light gray (10YR 6/1) clay; strong medium angular blocky structure; firm; thick continuous clay films on faces of peds; 5 percent, by volume, chert fragments; strongly acid.

The solum is 60 to more than 100 inches thick. Reaction ranges from slightly acid to strongly acid in the A horizon and strongly acid to very strongly acid in the B horizon.

The A horizon is 5 to 15 inches thick. The A1 horizn has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4, 5, or 6, and chroma of 3 or 4. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The content of chert ranges from 35 to 75 percent in the A horizon.

The B1 horizon, if present, has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. It is very cherty silt loam or very cherty silty clay loam. The content of chert ranges from 35 to 45 percent. The B2t horizon has hue of 5YR and value of 4 and chroma of 6 or value of 5 and chroma of 6 or 8, or it has hue of 2.5YR and value of 3 and chroma of 6 or value of 4 or 5 and chroma of 6 or 8. The lower part of the B2t horizon is mottled in shades of red, brown, and gray. The B21t horizon is cherty silty clay, cherty clay, silty clay, or clay, and the B22t and B23t horizons are silty clay or clay. The content of chert ranges from 0 to 30 percent in the B21t horizon and from 0 to 10 percent in the B22t and B23t horizons.

Elsah series

The Elsah series consists of deep, somewhat excessively drained, moderately rapidly permeable soils that formed in cherty and loamy alluvium. These are level or nearly level soils on narrow flood plains. The native vegetation is bottomland hardwoods. Slope ranges from 0 to 3 percent.

Elsah soils are geographically associated with Agnos, Arkana, Doniphan, Gassville, Gepp, Moko, Peridge, Secesh, and Sturkie soils. Agnos, Doniphan, and Gassville soils are on uplands and side slopes at a higher elevation and have a clayey control section and an argillic horizon. Arkana and Gepp soils are on uplands and side slopes at a higher elevation and have a very-fine control section and an argillic horizon. Moko soils are on uplands and side slopes at a higher elevation, are less than 20 inches deep to bedrock, and have a mollic epipedon. Peridge soils are on stream terraces at a slightly higher elevation and have a fine-silty control section and an argillic horizon. Secesh soils have a fine-loamy control section and an argillic horizon. Sturkie soils are on flood plains along larger streams and have a fine-silty control section and a mollic epipedon.

Typical pedon of Elsah cherty loam, in an area of Secesh and Elsah soils, frequently flooded, in a field in the NE1/4SE1/4NE1/4 sec. 22, T. 20 N., R. 6 W., Fulton County:

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) cherty loam; moderate medium subangular blocky structure; friable; common fine and medium roots; 30 percent, by volume, chert fragments; neutral; gradual wavy boundary.
C1—8 to 28 inches; dark brown (7.5YR 4/4) very cherty loam; massive; friable; common medium and fine roots; 45 percent, by volume, chert fragments; neutral; clear wavy boundary.
C2—28 to 40 inches; dark yellowish brown (10YR 4/4) very cherty silt loam; massive; very friable; common fine and medium roots; common fine tubular pores; 35 percent, by volume, chert fragments; neutral; clear wavy boundary.
C3—40 to 72 inches; dark brown (7.5YR 4/4) and brown (7.5YR 5/4) very cherty loam; massive; few medium roots; 70 percent, by volume, chert fragments; neutral; abrupt smooth boundary.
R—72 inches; hard, level-bedded dolomite bedrock.

The loamy sediments are 60 to more than 80 inches thick. Reaction ranges from medium acid to neutral throughout.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. It is cherty silt loam or cherty loam. The content of chert ranges from 15 to 35 percent, by volume. The A horizon is 6 to 10 inches thick.

The C horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4, or hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is very cherty loam or very cherty silt loam. The content of chert ranges from 35 to 75 percent, by volume.

Estate series

The Estate series consists of deep, well drained, slowly permeable soils that formed in residuum of weathered interbedded sandstone and limestone. These are moderately sloping to steep soils on upland side slopes. Slopes are 8 to 40 percent.

Estate soils are geographically associated with Brockwell, Moko, Noark, Portia, and Wideman soils. Brockwell soils are on uplands at a lower elevation and have a coarse-loamy control section and a solum more than 60 inches thick. Moko soils are on the same landscape as Estate soils, are less than 20 inches deep to bedrock, and do not have an argillic horizon. Noark soils are on ridges and side slopes at a higher elevation and have a clayey-skeletal control section and a solum more than 60 inches thick. Portia soils are on foot slopes and uplands at a lower elevation and have a fine-loamy control section and a solum more than 60 inches thick. Wideman soils are on narrow flood plains, have a sandy control section, and do not have an argillic horizon.

Typical pedon of Estate stony sandy loam, in an area of Estate-Portia-Moko association, rolling, in a moist wooded area in the NE1/4SW1/4NE1/4 sec. 34, T. 17 N., R. 10 W., Izard County:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) stony sandy loam; weak medium granular structure; very friable; common fine roots; 15 percent, by volume, sandstone and limestone fragments 1/2-inch to 20 inches in diameter; strongly acid; clear smooth boundary.
A2—2 to 7 inches; yellowish brown (10YR 5/4) stony sandy loam; weak medium subangular blocky structure; very friable; common fine and medium roots; 15 percent, by volume, sandstone and limestone fragments 1/2-inch to 20 inches in diameter; few pockets of dark grayish brown sandy loam in old root channels; medium acid; clear smooth boundary.
B1—7 to 13 inches; yellowish red (5YR 4/6) sandy loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common fine pores; 5 percent, by volume, sandstone gravel; slightly acid; gradual smooth boundary.
B21t—13 to 22 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds and in pores; few fine and medium roots; common fine pores; 10 percent, by volume, sandstone gravel; few black stains; slightly acid; gradual smooth boundary.
B22t—22 to 37 inches; red (2.5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds and in pores; few fine and medium roots; common fine pores; 10 percent, by volume, sandstone gravel; many black stains; slightly acid; gradual wavy boundary.
B23t—37 to 48 inches; red (2.5YR 4/6) clay with common medium distinct strong brown (7.5YR 5/6) and common medium faint yellowish red (5YR 5/6) mottles; moderate fine angular blocky structure; firm; thin continuous clay films on faces of peds; few fine roots; 10 percent, by volume, weathered sandstone gravel; many black stains; slightly acid; abrupt wavy boundary.
R—48 to 50 inches; hard, undulating limestone bedrock.

The solum is 40 to 60 inches thick. Depth to hard bedrock ranges from 40 to 60 inches. Reaction ranges from neutral to strongly acid in the A horizon and neutral to medium acid in the B horizon.

The A horizon is 5 to 11 inches thick. The A1 horizon has hue of 10YR, value of 4, and chroma of 2, 3, or 4. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The A horizon is stony sandy loam or stony fine sandy loam. The content of coarse fragments is 15 to 30 percent.

The B1 horizon has hue of 7.5YR with value of 4 and chroma of 4 or value of 5 and chroma of 6 or 8, or it has hue of 5YR, value of 4, and chroma of 6. This horizon is sandy loam, clay loam, or sandy clay loam, or their gravelly analogs. The content of coarse fragments is 5 to 25 percent. The B2t horizon has hue of 5YR with value of 4 and chroma of 6 or value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. Mottles are in shades of brown or red. This horizon is clay, clay loam, sandy clay, gravelly clay loam, or cobbly clay loam. The content of coarse fragments is 0 to 25 percent.

The Cr horizon, if present, is soft, weathered limestone or sandstone.

The R horizon is hard, undulating limestone or sandstone. It has few cracks that are spaced horizontally 6 inches or more apart.

Gassville series

The Gassville series consists of moderately deep to deep, well drained, very slowly permeable soils that formed in clayey residuum of weathered siltstone and dolomite bedrock. These are gently sloping to moderately steep soils on uplands. Slopes are 3 to 20 percent.

Gassville soils are geographically associated with Agnos, Arkana, Captina, Doniphan, Elsah, Gepp, Moko, and Secesh soils. Agnos soils are in lower positions on uplands and have a dominantly brown or yellowish brown subsoil. Arkana soils are at a slightly lower elevation, have a mollic epipedon, and have more than 35 percent base saturation. Captina soils are on broad upland flats and have a fragipan and a fine-silty control section. Doniphan soils are on the same landscape as Gassville soils and are more than 60 inches deep to bedrock. Elsah soils are on narrow flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Gepp soils are at a slightly higher elevation, have more than 35 percent base saturation, and are more than 60 inches deep to bedrock. Moko soils are at a lower elevation, are less than 20 inches deep to bedrock, and do not have an argillic horizon. Secesh soils are on narrow flood plains and have a fine-loamy control section and more than 35 percent base saturation.

Typical pedon of Gassville very cherty silt loam, 8 to 20 percent slopes, in a moist wooded area in the SE1/4SE1/4SE1/4 sec. 25, T. 21 N., R. 11 W., Fulton County:

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; moderate medium granular structure; very friable; many medium roots; 65 percent, by volume, fragments of chert; slightly acid; abrupt smooth boundary.

A2—2 to 9 inches; brown (10YR 5/3) very cherty silt loam; moderate medium granular structure; friable; many medium roots; 55 percent, by volume, fragments of chert; medium acid; clear smooth boundary.

B21t—9 to 17 inches; yellowish red (5YR 5/6) cherty clay; weak medium subangular blocky structure; firm; common fine roots; common medium pores; continuous thin clay films on faces of peds and pore walls; 30 percent, by volume, fragments of chert; strongly acid; gradual smooth boundary.

B22t—17 to 23 inches; red (2.5YR 4/6) cherty clay; moderate fine subangular blocky structure; firm; common fine roots; common medium pores; continuous thin clay films on faces of peds and pore walls; 25 percent, by volume, fragments of chert; very strongly acid; gradual smooth boundary.

B23t—23 to 34 inches; 50 percent strong brown (7.5YR 5/6) and 50 percent yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; firm; common medium pores; continuous thin clay films on faces of peds and pore walls; 5 percent, by volume, fragments of chert; very strongly acid; gradual smooth boundary.

B24t—34 to 40 inches; 75 percent yellowish red (5YR 5/6) and 25 percent strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; firm; common fine pores; continuous thin clay films on faces of peds and pore walls; 5 percent, by volume, fragments of chert; very strongly acid; gradual smooth boundary.

Cr—40 to 58 inches; highly fractured, soft siltstone bedrock that has red (2.5YR 4/6) clay filling cracks and crevices.

R—58 to 60 inches; level-bedded, hard dolomite bedrock.

The solum is 30 to 50 inches thick. The depth to hard rock ranges from 40 to 60 inches. Reaction ranges from slightly acid to strongly acid in the A horizon and is strongly acid or very strongly acid in the B horizon.

The A horizon is from 7 to 14 inches thick. The A1 horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The A2 horizon has hue of 10YR with value of 4 or 5 and chroma of 3 or value of 6 and chroma of 4. The content of chert ranges from 35 to 70 percent.

The B1 horizon, if present, has hue of 7.5YR, value of 5, and chroma of 4 or 6. It is very cherty silt loam or very cherty silty clay loam. The content of chert ranges from 35 to 70 percent. The B21t horizon has hue of 5YR, value of 5, and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 6. It is clay, silty clay, cherty clay, or cherty silty clay. The content of chert ranges from 5 to 30 percent. The B22t horizon has hue of 2.5YR, value of 4, and chroma of 6 or 8, or it has hue of 5YR and value of 4 and chroma of 6 or value of 5 and chroma of 8. It is mottled in shades of brown. It is clay or cherty clay. The content of chert ranges from 5 to 25 percent. The B23t and B24t horizons have hue of 5YR and value of 5 and chroma of 6 or 8 or value of 4 and

chroma of 6; or they have hue of 2.5YR, value of 4, and chroma of 6 or 8, or hue of 7.5YR, value of 5, and chroma of 6. They are mottled in shades of brown. They are clay or cherty clay. The content of chert ranges from 5 to 25 percent, by volume.

The Cr horizon is soft, weathered siltstone 1 to 30 inches thick.

The R horizon is hard siltstone or dolomite.

Gepp series

The Gepp series consists of deep, well drained, moderately permeable soils that formed in clayey residuum of weathered dolomite bedrock. These are gently sloping to moderately steep soils on uplands. Slopes are 3 to 20 percent.

Gepp soils are geographically associated with Agnos, Arkana, Captina, Doniphan, Elsah, Gassville, Moko, and Secesh soils. Agnos soils have a dominantly brown or yellowish brown subsoil and less than 35 percent base saturation. Arkana soils are at a lower elevation, have a mollic epipedon, and are less than 40 inches deep to bedrock. Captina soils are on broad upland flats and have a fragipan and a fine-silty control section. Doniphan soils are at a slightly lower elevation and have a clayey control section and less than 35 percent base saturation. Elsah soils are on narrow flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Gassville soils are at a slightly lower elevation, have less than 35 percent base saturation, and are less than 60 inches deep to bedrock. Moko soils are at a lower elevation, are less than 20 inches deep to bedrock, and do not have an argillic horizon. Secesh soils are on narrow flood plains and have a fine-silty control section and siliceous mineralogy.

Typical pedon of Gepp very cherty silt loam, 3 to 8 percent slopes, in a pasture in the NW1/4NW1/4NE1/4 sec. 18, T. 21 N., R. 5 W., Fulton County:

Ap—0 to 7 inches; brown (10YR 5/3) very cherty silt loam; moderate medium granular structure; friable; many fine roots; 35 percent, by volume, angular fragments of chert 1/2 inch to 6 inches in diameter; medium acid; abrupt smooth boundary.

B1—7 to 12 inches; yellowish red (5YR 5/6) cherty silty clay loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; 20 percent, by volume, angular fragments of chert 1/2 inch to 6 inches in diameter; medium acid; gradual smooth boundary.

B21t—12 to 40 inches; red (2.5YR 4/6) clay; moderate fine and medium subangular blocky structure; firm; common fine roots; common fine pores; thin continuous clay films on faces of peds; strongly acid; gradual irregular boundary.

B22t—40 to 75 inches; red (2.5YR 4/6) cherty clay; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium blocky structure; firm, slightly plastic; few fine roots; common fine pores; common thin clay films on faces of peds; 15 percent, by volume, angular fragments of chert and fragments of siltstone 1/2 inch to 8 inches in diameter; strongly acid; abrupt smooth boundary.

R—75 to 80 inches; cherty dolomite bedrock with cracks and crevices filled with red clay.

The solum is 60 to more than 90 inches thick. Reaction ranges from slightly acid to strongly acid in the A horizon and medium acid to very strongly acid in the B1 and B21t horizons and is medium acid or strongly acid in the lower part of the B22t horizon.

The A horizon is 5 to 12 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The content of chert in the A horizon ranges from 35 to 75 percent, by volume.

The B1 horizon has hue of 7.5YR, value of 5, and chroma of 4 or 6, or hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 or 6. It is cherty silt loam or cherty silty clay loam. The B2t horizon has hue of 5YR, value of 4, and chroma of 6 or value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 3, and chroma of 6 or value of 4 or 5 and chroma of 6 or 8. The B2t horizon has mottles in shades of red, brown, and gray. The texture of the B21t horizon is clay, and that of the B22t and B23t horizons is cherty clay or clay. The content of chert, by volume, ranges from 0 to 30 percent in the B1 horizon and 0 to 20 percent in the B2t horizon.

Hontas series

The Hontas series consists of deep, moderately well drained, moderately permeable, level soils that formed in silty alluvium. These soils are on flood plains of creeks and rivers. They are frequently flooded and are saturated with water for brief periods late in winter and early in spring. The native vegetation is hardwood forest. Slopes are 0 to 1 percent.

Hontas soils are geographically associated with Melvin, Peridge, and Wideman soils. Melvin soils are on flood plains parallel to major streams and are poorly drained. Peridge soils are on adjacent higher terraces, are well drained, and have an argillic horizon. Wideman soils are on narrow flood plains parallel to small upland streams, have a sandy control section, and are excessively drained.

Typical pedon of Hontas silt loam, frequently flooded, in a moist cultivated area in the SE1/4NW1/4NW1/4 sec. 2, T. 17 N., R. 7 W., Izard County:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—6 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure;

friable; few fine roots; few fine pores; few dark brown stains; slightly acid; clear smooth boundary.
B21—11 to 22 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; few black concretions; few dark brown stains; slightly acid; gradual smooth boundary.
B22—22 to 40 inches; grayish brown (10YR 5/2) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine pores; common fine black concretions; common dark brown and black stains; slightly acid; gradual smooth boundary.
C1—40 to 56 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; firm; few fine black concretions; few dark brown stains; slightly acid; gradual wavy boundary.
C2—56 to 72 inches; gray (10YR 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; firm; few fine pores; few dark brown stains; slightly acid.

The solum is 30 to 50 inches thick. Reaction is slightly acid or neutral in the A horizon, medium acid or slightly acid in the B horizon, and slightly acid to mildly alkaline in the C horizon.

The A horizon is 4 to 14 inches thick. The Ap horizon has hue of 10YR with value of 4 or 5 and chroma of 3 or value of 4 and chroma of 4.

The B21 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The B22 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B horizon is silt loam or silty clay loam. Mottles are in shades of brown and gray.

The C horizon has hue of 10YR, value of 4, 5, or 6, and chroma of 1 or 2. It is silt loam or silty clay loam. Mottles are in shades of brown.

Melvin series

The Melvin series consists of deep, poorly drained, moderately permeable, level soils that formed in silty alluvium. These soils are on flood plains of creeks and rivers. They are frequently flooded and are saturated with water for brief periods late in winter and early in spring. The native vegetation is hardwood forest. Slopes are 0 to 1 percent.

Melvin soils are geographically associated with Hontas, Peridge, and Wideman soils. Hontas soils are on flood plains along major streams and are moderately well drained. Peridge soils are on higher terraces, have an argillic horizon, and are well drained. Wideman soils are on narrow flood plains parallel to small upland streams, have a sandy control section, and are excessively drained.

Typical pedon of Melvin silt loam, frequently flooded, in a moist meadow in the NW1/4SE1/4NE1/4 sec. 12, T. 18 N., R. 9 W., Izard County:

Ap—0 to 6 inches; brown (10YR 5/3) silt loam; common fine distinct yellowish brown (10YR 5/6) and yellowish red (5YR 4/6) mottles; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.
B21g—6 to 16 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct grayish brown (10YR 5/2), dark brown (10YR 3/3), and yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; few fine roots; few fine pores; few dark brown stains; neutral; clear smooth boundary.
B22g—16 to 30 inches; light gray (10YR 7/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; few fine pores; few black concretions; few dark brown stains; neutral; gradual smooth boundary.
C1g—30 to 45 inches; light gray (10YR 7/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; few fine pores; common fine black concretions; common dark brown and black stains; neutral; gradual wavy boundary.
C2g—45 to 60 inches; light gray (10YR 7/1) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; firm; many medium black concretions; few dark brown stains; neutral; gradual wavy boundary.
C3g—60 to 72 inches; gray (10YR 6/1) silty clay loam; many medium distinct light gray (10YR 7/1) and yellowish brown (10YR 5/6) mottles; massive; firm; few fine pores; few dark brown stains; slightly acid.

The solum is 20 to 40 inches thick. Reaction ranges from slightly acid to mildly alkaline throughout.

The A horizon is 5 to 10 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 5, 6, or 7, and chroma of 1 or 2. It is silt loam or silty clay loam. Mottles are in shades of brown or red.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1. It is silt loam or silty clay loam. Mottles are in shades of brown.

Moko series

The Moko series consists of shallow, well drained, moderately permeable soils that formed in residuum of limestone or dolomite. These soils are on mountainsides, ridges, and uplands. Slopes are 3 to 50 percent.

Moko soils are geographically associated with Agnos, Arkana, Doniphan, Elsah, Estate, Gassville, Gepp, Noark,

Portia, and Secesh soils. Agnos soils are at a higher elevation, have an argillic horizon, and are more than 60 inches deep to hard bedrock. Arkana soils have an argillic horizon and are more than 20 inches deep to bedrock. Doniphan soils are at a higher elevation, have an argillic horizon, and are more than 60 inches deep to bedrock. Elsah soils are on narrow flood plains and are more than 60 inches deep to bedrock. Estate soils have an argillic horizon and are more than 40 inches deep to bedrock. Gassville soils are at a higher elevation, have an argillic horizon, and are more than 40 inches deep to bedrock. Gepp and Noark soils are at higher elevations, have an argillic horizon, and are more than 60 inches deep to bedrock. Portia soils are at a lower elevation, have an argillic horizon, and are more than 60 inches deep to bedrock. Secesh soils are on narrow flood plains, have a fine-loamy control section, and are more than 20 inches deep to bedrock.

Typical pedon of Moko very stony clay loam, in an area of Arkana-Moko complex, 8 to 20 percent slopes, in a moist wooded area in the SE1/4NE1/4NE1/4 sec. 7, T. 20 N., R. 6 W., Fulton County:

O1—1 inch to 0; hardwood leaves and cedar needles.
A11—0 to 2 inches; very dark brown (10YR 2/2) very stony clay loam; moderate fine granular structure; friable; many fine pores; many fine, medium, and coarse roots; 20 percent, by volume, chert gravel; 50 percent, by volume, fragments of dolomite 3 to 12 inches in diameter; mildly alkaline; clear smooth boundary.
A12—2 to 10 inches; very dark grayish brown (10YR 3/2) very stony clay loam; weak fine and medium subangular blocky structure; friable; many fine pores; many fine, medium, and coarse roots; 15 percent, by volume, chert gravel; 60 percent, by volume, fragments of dolomite 3 to 12 inches in diameter; mildly alkaline; abrupt smooth boundary.
R—10 to 12 inches; hard, gray, level-bedded dolomite bedrock.

The solum is 6 to 20 inches thick. The depth to bedrock ranges from 6 to 20 inches. Reaction is neutral or mildly alkaline throughout. The content of chert gravel ranges from 10 to 25 percent, by volume. Fragments of dolomite or limestone greater than 3 inches in diameter make up 25 to 60 percent of the solum.

The A horizon is 6 to 20 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is very stony silt loam, very stony loam, very stony clay loam, or very stony silty clay loam.

The R horizon is hard, level-bedded limestone or dolomite bedrock.

Noark series

The Noark series consists of deep, well drained, moderately permeable soils that formed in residuum of weathered cherty limestone bedrock. These are gently sloping to steep soils on uplands. Slopes are 3 to 40 percent.

Noark soils are geographically associated with Arkana, Elsah, Estate, Moko, Portia, and Secesh soils. Arkana soils are at a lower elevation, are less than 40 inches deep to bedrock, and have a very-fine control section. Elsah soils are on narrow flood plains, do not have an argillic horizon, and have a loamy-skeletal control section. Estate soils are on hillsides at a lower elevation, are less than 60 inches deep to bedrock, and have a clayey control section. Moko soils are on hillsides at a lower elevation, are less than 20 inches deep to bedrock, and do not have an argillic horizon. Portia soils are on foot slopes at a lower elevation, have a fine-loamy control section, and do not contain chert fragments. Secesh soils are on narrow flood plains and have a fine-loamy control section.

Typical pedon of Noark very cherty silt loam, 8 to 20 percent slopes, in a moist wooded area, NW1/4SE1/4SE1/4 sec. 19, T. 16 N., R. 9 W., Izard County:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) very cherty silt loam; moderate fine granular structure; friable; 50 percent, by volume, angular chert fragments; many fine roots; medium acid; clear smooth boundary.
A2—2 to 10 inches; brown (10YR 5/3) very cherty silt loam; weak medium subangular blocky structure; friable; 40 percent, by volume, angular chert fragments; common fine and medium roots; strongly acid; gradual smooth boundary.
B1—10 to 16 inches; yellowish red (5YR 4/6) very cherty silt loam; moderate medium subangular blocky structure; friable; 60 percent, by volume, angular chert fragments; common fine roots; very strongly acid; gradual smooth boundary.
B21t—16 to 30 inches; red (2.5YR 4/6) very cherty silty clay; moderate fine angular blocky structure; firm; thin continuous clay films on faces of peds; 50 percent, by volume, angular chert fragments; common fine and medium roots; very strongly acid; gradual smooth boundary.
B22t—30 to 72 inches; red (2.5YR 4/6) very cherty silty clay; moderate fine angular blocky structure; firm; thick continuous clay films on faces of peds; few fine roots; 70 percent, by volume, soft chert fragments; small pockets of dark yellowish brown (10YR 4/4) silt loam from decomposed chert fragments; very strongly acid.

The solum is 60 to more than 80 inches thick. Reaction ranges from strongly acid to slightly acid in the A horizon and is very strongly acid or strongly acid in the B horizon.

The A horizon is 8 to 18 inches thick. The Ap horizon, if present, has hue of 10YR, value of 3 or 4, and chroma

of 3 or 4. The A1 horizon has hue of 10YR, value of 4, and chroma of 2 or 3 or value of 3 and chroma of 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3. The content of chert in the A horizon ranges from 35 to 70 percent.

The B1 horizon has hue of 5YR, value of 4, and chroma of 6, or it has hue of 7.5YR or 10YR, value of 5 and chroma of 6. It is very cherty silt loam or very cherty silty clay loam. The B21t horizon has hue of 2.5YR and either value of 4 and chroma of 6 or 8 or value of 3 and chroma of 6, or it has hue of 5YR, value of 4, and chroma of 6 or 8. The B22t horizon has hue of 2.5YR and either value of 4 and chroma of 6 or 8 or value of 3 and chroma of 6, or it has hue of 5YR, value of 4, and chroma of 6 or 8. In most pedons it has few to common strong brown mottles. The B21t and B22t horizons are very cherty clay or very cherty silty clay. The content of chert ranges from 35 to 70 percent by volume in the B21t horizon and 50 to 80 percent by volume in the B22t horizon.

Peridge series

The Peridge series consists of deep, well drained, moderately permeable soils that formed in old alluvial sediment. These are gently sloping soils on stream terraces and uplands. Slopes are 3 to 8 percent.

Peridge soils are geographically associated with Elsah, Hontas, Melvin, Secesh, and Sturkie soils. Elsah soils are on flood plains, have a loamy-skeletal control section, and do not have an argillic horizon. Hontas soils are on lower flood plains, do not have an argillic horizon, and are moderately well drained. Melvin soils are on flood plains, do not have an argillic horizon, and are poorly drained. Secesh soils are on flood plains and have a fine-loamy control section and siliceous mineralogy. Sturkie soils are on flood plains, have a mollic epipedon, and do not have an argillic horizon.

Typical pedon of Peridge silt loam, 3 to 8 percent slopes, in an idle pasture in the SE1/4SE1/4NE1/4 sec. 3, T. 19 N., R. 6 W., Fulton County:

Ap—0 to 6 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; common very fine pores; slightly acid; clear smooth boundary.

B21t—6 to 20 inches; yellowish red (5YR 4/6) silt loam; weak medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; few fine roots; common fine and medium pores; few very fine black concretions; medium acid; clear smooth boundary.

B22t—20 to 34 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; common thin patchy clay films on faces of peds and lining pores; few fine pores; few fine black concretions; medium acid; clear smooth boundary.

B23t—34 to 50 inches; yellowish red (5YR 4/6) silty clay loam; few medium faint red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; common medium pores; common black stains; medium acid; gradual smooth boundary.

B24t—50 to 65 inches; red (2.5YR 4/6) silty clay loam; common medium distinct brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; common medium and large pores; 5 percent, by volume, fine chert pebbles; common black stains; strongly acid; gradual smooth boundary.

B25t—65 to 80 inches; red (2.5YR 4/6) silty clay loam; few medium distinct brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; common medium and large pores; 5 percent, by volume, chert pebbles; common black stains; strongly acid.

The solum is 80 inches or more thick. Reaction is strongly acid or medium acid throughout unless the surface layer has been limed.

The A horizon is 5 to 8 inches thick. The Ap horizon has hue of 7.5YR, value of 4, and chroma of 4, or it has hue of 10YR, value of 4 or 5, and chroma of 3. The content of gravel, by volume, ranges from 0 to 5 percent.

The B1 horizon, if present, is 3 to 7 inches thick. It has hue of 5YR, value of 4, and chroma of 4 or hue of 7.5YR, value of 4 or 5, and chroma of 4. The content of gravel, by volume, ranges from 0 to 5 percent. The B21t and B22t horizons have hue of 5YR, value of 4, and chroma of 6, or hue of 2.5YR, value of 4, and chroma of 6 or 8. They are silty clay loam or silt loam. The content of gravel, by volume, ranges from 0 to 5 percent. The B23t, B24t, and B25t horizons have hue of 2.5YR, value of 4, and chroma of 6 or 8, or they have hue of 5YR, value of 4, and chroma of 6. They are mottled in shades of brown. They are silty clay loam or silty clay. The content of gravel, by volume, ranges from 0 to 15 percent.

Portia series

The Portia series consists of deep, well drained, moderately slowly permeable soils that formed in loamy residuum or colluvium derived from weathered interbedded sandstone and limestone. These are gently sloping to steep soils on foot slopes and uplands. The native vegetation is mixed upland hardwoods and pines. Slopes are 3 to 30 percent.

Portia soils are geographically associated with Brockwell, Boden, Estate, Moko, Noark, and Wideman soils. Brockwell soils have a coarse-loamy control section and a brown subsoil. Boden soils have a clayey control section and are less than 60 inches deep to

bedrock. Estate soils are on side slopes at a higher elevation, have a fine control section, and have a solum of less than 60 inches. Moko soils are on side slopes at a higher elevation, are less than 20 inches deep to bedrock, and do not have an argillic horizon. Noark soils are on ridges and side slopes at a much higher elevation, have a clayey-skeletal control section, and formed in residuum of cherty limestone. Wideman soils are on narrow flood plains, have a sandy control section, and do not have an argillic horizon.

Typical pedon of Portia sandy loam, 3 to 8 percent slopes, eroded, in a moist idle field in the SW1/4SE1/4NW1/4 sec. 10, T. 17 N., R. 10 W., Izard County:

Ap—0 to 7 inches; brown (10YR 4/3) sandy loam; weak medium granular structure; friable; many fine roots; medium acid; clear smooth boundary.

B1—7 to 12 inches; dark brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; common fine roots; common fine pores; medium acid; clear smooth boundary.

B21t—12 to 30 inches; reddish brown (5YR 4/4) loam; moderate medium subangular blocky structure; friable; common thin patchy clay films on faces of peds; common fine and medium roots; common fine pores; common dark stains on faces of peds; few medium black concretions; strongly acid; gradual smooth boundary.

B22t—30 to 51 inches; yellowish red (5YR 4/6) loam; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; common medium roots; common fine pores; common dark stains on faces of peds; few medium black concretions; 2 percent, by volume, sandstone gravel that has fine dark coatings; strongly acid; gradual smooth boundary.

B23t—51 to 63 inches; red (2/5YR 4/6) clay loam; weak medium subangular blocky structure; firm; some peds slightly firm; many thin patchy clay films on faces of peds; common dark stains on faces of peds; few medium black concretions; strongly acid; gradual smooth boundary.

B24t—63 to 80 inches; red (2.5YR 4/6) clay; weak medium subangular blocky structure; friable; many thin patchy clay films on faces of peds; 5 percent, by volume, sandstone gravel that has soft, dark coatings; common dark stains on faces of peds; several small pockets of reddish brown (5YR 4/4) and dark brown (7.5YR 4/4) sandy loam; strongly acid.

The solum is 60 to 80 inches thick. Reaction ranges from strongly acid to slightly acid in the A horizon, from very strongly acid to medium acid in the B1 horizon and the upper part of the B2t horizon, and from strongly acid to medium acid in the lower part of the B2t horizon.

The A horizon is 3 to 16 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4. The A1 horizon, if present, has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Some pedons have an A2 horizon that has hue of 10YR, value of 5, and chroma of 3 or 4.

The B1 horizon has hue of 7.5YR with either value of 4 and chroma of 4 or value of 5 and chroma of 4, 6, or 8. It is loam, fine sandy loam, or sandy loam. The B21t horizon has hue of 5YR and either value of 4 and chroma of 4 or 6 or value of 5 and chroma of 6 or 8; or it has hue of 2.5YR, value of 4 or 5, and chroma of 6 or 8. It is sandy clay loam or loam. The B22t horizon has hue of 5YR and either value of 4 and chroma of 6 or value of 5 and chroma of 6 or 8, or it has hue of 2.5YR, value of 4, and chroma of 6 or 8. It is loam, sandy clay loam, clay loam, or sandy clay. The B23t and B24t horizons have hue of 5YR, value of 4, and chroma of 6 or 8, or they have hue of 2.5YR and either value of 3 and chroma of 6 or value of 4 and chroma of 6 or 8. They have mottles in shades of brown. They are sandy clay loam, clay loam, sandy clay, or clay.

Ramsey series

The Ramsey series consists of shallow, somewhat excessively drained, rapidly permeable soils that formed in residuum of acid sandstone. These are gently sloping to steep soils on uplands. Slope ranges from 3 to 40 percent.

Ramsey soils are geographically associated with Brockwell, Estate, Portia, and Wideman soils. Brockwell soils are more than 60 inches deep to bedrock and have an argillic horizon. Estate soils are more than 40 inches deep to bedrock and have an argillic horizon. Portia soils are more than 60 inches deep to bedrock and have an argillic horizon. Wideman soils are on narrow flood plains, have a solum more than 60 inches thick, and have a sandy control section.

Typical pedon of Ramsey stony sandy loam, from an area of Ramsey-Rock outcrop complex, 3 to 15 percent slopes, in a wooded area in the SE1/4SE1/4NW1/4 sec. 16, T. 17 N., R. 11 W., Izard County:

A1—0 to 1 inch; dark brown (10YR 3/3) stony sandy loam; weak fine granular structure; friable; many fine and medium roots; common fine pores; 15 percent, by volume, sandstone fragments; strongly acid; abrupt smooth boundary.

A2—1 to 6 inches; brown (10YR 4/3) stony sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; common fine and medium pores; 20 percent, by volume, sandstone fragments; very strongly acid; gradual smooth boundary.

B—6 to 16 inches; yellowish brown (10YR 5/4) stony sandy loam; moderate medium subangular blocky structure; friable; common medium roots; common fine pores; 20 percent, by volume, sandstone fragments; very strongly acid; abrupt smooth boundary.

R—16 to 18 inches; hard, level-bedded, acid sandstone bedrock.

The solum is 10 to 20 inches thick. Reaction is strongly acid or very strongly acid throughout.

The A horizon is 3 to 7 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR and either value of 4 and chroma of 2 or 3 or value of 5 and chroma of 3 or 4. The A horizon is stony sandy loam or stony fine sandy loam. The content of coarse fragments ranges from 15 to 35 percent, by volume.

The B horizon has hue of 10YR and either value of 4 and chroma of 4 or value of 5 and chroma of 4, or 6, or it has hue of 7.5YR, value of 5, and chroma of 6. It is stony sandy loam. The content of coarse fragments ranges from 15 to 35 percent, by volume.

The R horizon is hard, acid sandstone bedrock.

Secesh series

The Secesh series consists of deep, well drained, moderately permeable soils that formed in loamy alluvium on flood plains of streams. These soils are level or nearly level. The native vegetation is bottomland hardwoods. Slopes are 0 to 3 percent.

Secesh soils are geographically associated with Agnos, Arkana, Doniphan, Elsah, Gassville, Gepp, Moko, Peridge, and Sturkie soils. Agnos, Doniphan, and Gassville soils are on uplands and side slopes and have a clayey control section and less than 35 percent base saturation. Arkana and Gepp soils are on uplands and side slopes at a higher elevation and have a very-fine control section and mixed mineralogy. Elsah soils have a loamy-skeletal control section and do not have an argillic horizon. Moko soils are on upland side slopes, are less than 20 inches deep to bedrock, and have a loamy-skeletal control section. Peridge soils are on terraces at a slightly higher elevation and have mixed mineralogy and a fine-silty control section. Sturkie soils are on flood plains at a slightly higher elevation, have a fine-silty control section, and do not have an argillic horizon.

Typical pedon of Secesh silt loam, in an area of Secesh-Elsah soils, frequently flooded, in a moist field in NW1/4NE1/4SE1/4 sec. 19, T. 20 N., R. 15 W., Fulton County:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam; weak medium subangular blocky structure; friable; many fine roots; common fine pores; 10 percent, by volume, rounded chert gravel; slightly acid; gradual smooth boundary.

B1—8 to 12 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; very friable; common fine roots; few fine pores; 10 percent, by volume, fine chert gravel; many root channels filled with dark brown (10YR 3/3) silt loam; medium acid; gradual smooth boundary.

B21t—12 to 30 inches; strong brown (7.5YR 5/6) cherty silty clay loam; weak medium subangular blocky structure; very friable; thin patchy clay films on faces of peds; 20 percent, by volume, fine chert gravel; medium acid; gradual smooth boundary.

IIB22t—30 to 55 inches; yellowish red (5YR 5/8) very cherty sandy clay loam; weak coarse subangular blocky structure, friable; thin patchy clay films on faces of peds; 35 percent, by volume, chert gravel; slightly acid; clear smooth boundary.

IIB23t—55 to 76 inches; strong brown 7.5YR 5/6) very cherty sandy clay loam; weak fine subangular blocky structure; friable; 50 percent, by volume, chert gravel; medium acid.

The solum is 30 to more than 60 inches thick. Reaction is medium acid or slightly acid in the A horizon and very strongly acid to slightly acid in the B and IIB horizons.

The A horizon is 6 to 9 inches thick. The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The content of gravel ranges from 0 to 10 percent by volume.

The B1 horizon, if present, has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or silt loam or gravelly loam or gravelly silt loam. Gravel content ranges from 0 to 15 percent by volume. The B2t and IIB2t horizons have hue of 10YR and either value of 4 and chroma of 4 or 6 or value of 5 and chroma of 4, 6, or 8; or they have hue of 7.5YR and either value of 4 and chroma of 4 or value of 5 and chroma of 4, 6, or 8; or they have hue of 5YR and either value of 4 and chroma of 4 or 6 or value of 5 and chroma of 4, 6, or 8. The B2t and IIB2t horizons are silty clay loam, sandy clay loam, or sandy clay, or the cherty or very cherty analogs. The content of chert or gravel ranges from 10 to 35 percent, by volume, in the B2t horizon, from 10 to 50 percent, by volume, in the upper part of the IIB2t horizon, and from 10 to 75 percent, by volume, in the lower part.

Sturkie series

The Sturkie series consists of deep, well drained, moderately permeable soils that formed in thick silty alluvium. These are nearly level soils on flood plains and natural levees of the White and Spring Rivers and other streams. Some areas of these soils on the White River are protected from flooding by upstream dams. The native vegetation is bottomland hardwoods and giant cane. Slope ranges from 1 to 3 percent.

Sturkie soils are geographically associated with Elsah, Peridge, and Secesh soils. Elsah soils are on slightly lower flood plains and along small tributaries, have a loamy-skeletal control section, and do not have a mollic epipedon. Peridge soils are on terraces, have an argillic horizon, and do not have a mollic epipedon. Secesh soils are on slightly lower flood plains and along smaller tributaries and have a fine-loamy control section and an argillic horizon.

Typical pedon of Sturkie silt loam, frequently flooded, in a moist meadow in the NW1/4NE1/4SE1/4 sec. 35, T. 20 N., R. 7 W., Fulton County:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium granular structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.
A12—7 to 19 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; many medium pores; medium acid; clear smooth boundary.
A13—19 to 28 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; many medium pores; medium acid; clear smooth boundary.
B21—28 to 46 inches; brown (10 4/3) silt loam; weak medium and coarse subangular blocky structure; friable; few fine and medium roots; common medium and coarse pores; slightly acid; gradual smooth boundary.
B22—46 to 57 inches; dark brown (10YR 3/3) silt loam; weak medium and coarse subangular blocky structure; friable; few fine and medium roots; common medium and coarse pores; slightly acid; gradual smooth boundary.
C1—57 to 70 inches; dark brown (10YR 3/3) silt loam; common medium distinct brown (10YR 5/3) mottles; massive; friable; common medium and coarse pores; neutral; gradual smooth boundary.
C2—70 to 80 inches; brown (10YR 5/3) loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine and medium roots; common fine and medium pores; 5 percent, by volume, rounded gravel; neutral.

The solum is 50 to more than 80 inches thick. Reaction ranges from medium acid to mildly alkaline in the A horizon and slightly acid to moderately alkaline in the B and C horizons. Mollic color is at a depth of 24 to more than 50 inches.

The A horizon is 10 to 30 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3, or hue of 7.5YR, value of 3, and chroma of 2. The content of gravel, by volume, ranges from 0 to 5 percent.

The B21 horizon has hue of 10YR, vlaue of 3, 4, or 5, and chroma of 3 or 4, or it has hue of 7.5YR, value of 3 and chroma of 2 or value of 4 and chroma of 4. It is silt loam or silty clay loam. The content of gravel, by volume, ranges from 0 to 5 percent.

The C horizon has hue of 10YR, value of 3, 4, or 5, and chroma of 2, 3, or 4, or it has hue of 7.5YR and either value of 3 and chroma of 2, or value of 4 or 5 and chroma of 4. It is silt loam or loam. The content of gravel, by volume, ranges from 0 to 10 percent.

Wideman series

The Wideman series consists of deep, excessively drained soils that formed in recent sandy alluvium. They have moderately rapid permeability. These are level to gently sloping soils on flood plains and natural levees along streams. These soils are frequently flooded. Slopes are 0 to 5 percent.

Wideman soils are geographically associated with Boden, Brockwell, Estate, Hontas, Melvin, Portia, and Ramsey soils. Boden, Brockwell, and Estate soils are on upland landscapes and have an argillic horizon; Boden soils have a clayey control section, Brockwell soils have a coarse-loamy control section, and Estate soils have a fine control section. Hontas and Melvin soils are on flood plains at a slightly higher elevation than Wideman soils, and they have a fine-silty control section; Hontas soils are moderately well drained, and Melvin soils are poorly drained. Portia soils are on upland landscapes and have an argillic horizon and a fine-loamy control section. Ramsey soils are on upland landscapes, are less than 20 inches deep to bedrock, and have a loamy control section.

Typical pedon of Wideman fine sand, frequently flooded, in a meadow in the SW1/4NE1/4NE1/4 sec. 20, T. 17 N., R. 9 W., Izard County:

A1—0 to 1 inch; dark brown (10YR 4/3) fine sand; weak fine granular structure; very friable; many fine and medium roots; extremely acid; abrupt smooth boundary.
A2—1 to 6 inches; yellowish brown (10YR 5/4) fine sand; weak fine granular structure; very friable; many fine and medium roots; extremely acid; clear smooth boundary.
C1—6 to 11 inches; dark yellowish brown (10YR 4/4) loamy fine sand; massive; very friable; common fine roots; few fine black masses; few thin light yellowish brown streaks; strongly acid; clear smooth boundary.
C2—11 to 32 inches; light yellowish brown (10YR 6/4) fine sand; single grained; very friable; few fine roots; common medium reddish brown and black masses; bedding planes in lower 4 inches; medium acid; clear wavy boundary.
C3—32 to 38 inches; brown (10YR 5/3) fine sandy loam; massive; friable; common fine roots; few fine pores; few fine black masses; reddish brown and strong brown stains and light yellowish brown streaks of loamy sand; strongly acid; clear smooth boundary.
C4—38 to 48 inches; very pale brown (10YR 7/3) fine sand; single grained; very friable; few fine roots; common medium yellowish red and few fine brown masses; slightly acid; abrupt smooth boundary.
C5—48 to 52 inches; dark grayish brown (10YR 4/2) fine sandy loam; massive; friable; few fine roots; common fine pores; common medium brown and black masses; very pale brown streaks of loamy sand; medium acid; abrupt smooth boundary.

C6—52 to 63 inches; very pale brown (10YR 7/3) fine sand; single grained; very friable; 1/2-inch lenses of fine gravel and common medium brown and black masses; yellowish brown stains; medium acid; clear smooth boundary.

C7—63 to 72 inches; dark grayish brown (10YR 4/2) loamy fine sand; massive; friable; common medium dark brown masses and streaks; strongly acid; clear smooth boundary.

C8—72 to 80 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; friable; strongly acid.

The sandy sediments are 60 to more than 80 inches thick. Reaction ranges from extremely acid to medium acid in the A horizon and strongly acid to neutral in the C horizon.

The A horizon has hue of 10YR, value of 3, 4, or 5, and chroma of 2, 3, or 4. The A horizon is 2 to 9 inches thick.

The C horizon has hue of 10YR, value of 4, 5, 6, or 7, and chroma of 2, 3, or 4. The 10- to 14-inch control section is dominantly loamy sand or fine sand and contains thin strata of loamy very fine sand or finer textures. Coarse fragments, dominantly gravel, make up 0 to 35 percent, by volume.

formation of the soils

The factors that affect soil formation in Fulton and Izard Counties are described in this section.

factors of soil formation

Soil is the collection of three-dimensional natural bodies on the earth's surface. Soil supports plant life and has properties resulting from the integrated effect of climate and living matter acting on parent material, as conditioned by relief, over periods of time.

The interaction of five main factors results in differences between soils. These factors are the physical and chemical composition of the parent material, the climate during and after the accumulation of the parent material, the kinds of plants and organisms living in the soil, the relief of the land and its effect on runoff, and the length of time it took the soil to form (*7*).

The influence of any factor can vary from place to place, but the interaction of all factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

climate

The climate in Fulton and Izard Counties is characterized by relatively mild winters, warm or hot summers, and fairly abundant rainfall. The present climate probably is similar to the climate under which the soils formed. The average daily maximum temperature is 93 degrees F in July, and 49 degrees F in January. Annual rainfall is about 45 inches and is generally well distributed throughout the year. For additional information about the climate, refer to the section "General nature of the survey area."

The warm, moist climate in the survey area promotes rapid soil formation, and the warm temperatures encourage rapid chemical reactions. The large amount of water that moves through the soil is instrumental in moving dissolved or suspended materials downward in the soil profile. Plant remains decompose rapidly, and the organic acid that forms hastens the removal of carbonates and the formation of clay. Because the soil is frozen only to a shallow depth and for a relatively short period, soil formation continues almost the year round. The climate throughout the survey area is relatively uniform, but its effect is modified locally by elevation and slope aspect. Climate alone does not account for differences in the soils in the survey area.

living organisms

Plants and animals, including insects, bacteria, and fungi, are important in the formation of soils. Among the changes they cause are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity.

Before Fulton and Izard Counties were settled, the native vegetation had more influence on soil formation than did animal activity. Forests consisting of stands of hardwood trees or mixed hardwoods and shortleaf pine covered most of the survey area.

In a few places scattered throughout the area, where the soils were gently sloping, there were sparse stands of hardwood trees and an understory of tall prairie grasses. Scattered across parts of both counties on the uplands are moderately deep and shallow soils that overlie dolomite or sandstone. These soils supported savannas. The vegetation on these savannas was eastern redcedar or mixed eastern redcedar and hardwoods. Grasses grew tall in openings between the trees. Arkana and Moko soils are dominant in these areas. These soils have a surface layer that has been darkened to a depth of several inches by the accumulation of organic matter.

The native vegetation on most of the rolling to steep, dissected uplands was upland oaks and hickory in mixed stands with shortleaf pine. The soils in these areas have a significant accumulation of organic matter and are dark colored only in the uppermost few inches. Agnos, Brockwell, Doniphan, Estate, Gassville, Gepp, and Noark soils formed on these uplands. They differ from other soils mainly in parent material, relief, age, and degree of weathering.

In the alluvial areas, the native vegetation was mainly hardwood trees, such as cottonwood, sycamore, elm, black walnut, ash, oak, and hickory. Sturkie, Secesh, Hontas, and Wideman soils formed in these areas.

Variations in native vegetation in the counties are related partly to variations in the available water capacity and in the surface and internal drainage of the soils. Slope aspect and soil fertility cause minor variations.

Only the major differences in the original vegetation are reflected to any extent in the characteristics of the soils.

Man is important to the future rate and direction of soil formation. He clears the forest, cultivates the land, and introduces new kinds of plants. He applies fertilizer,

organic residue, lime, and chemicals for insect, disease, and weed control. He builds dams for flood control, he cuts and fills and grades and compacts the soil surface, and he covers the surface with structures and pavements. Some of the results of these actions will not become known for many centuries. Nevertheless, the way that other living organisms affect soil formation in these counties has been drastically changed by man.

parent material

The soils in Fulton and Izard Counties formed in material that derived from weathered, consolidated bedrock of the Ordovician through Mississippian Periods of the Paleozoic Era (*3, 6*).

Fulton and Izard Counties lie within the Salem and Springfield Plateaus in the Ozark Plateau Province. The Springfield Plateau covers the extreme southern parts of Izard County. The Salem Plateau covers the remainder of Izard County and all of Fulton County.

The Cotter, Jefferson City, and Powell Formations of the Lower Ordovician Period cover most of the surface of the Salem Plateau in Fulton County and the northern and northeastern parts of Izard County. These formations consist mainly of fine-grained, gray to buff dolomite. The Cotter and Jefferson City Formations also contain chert. Agnos, Gassville, Doniphan, and Gepp soils formed in residuum of these formations.

Parts of southwestern Fulton County and most of Izard County are capped by St. Peter Sandstone and interbedded sandstone and limestone of the Everton Formation of the Middle Ordovician Period. These formations consist mainly of massive, light-colored, medium- to fine-grained, friable sandstone and gray limestone (*4*). Brockwell, Estate, and Portia soils formed in residuum of these formations.

Scattered across southern Izard County are areas of limestone of the Middle and Upper Ordovician Periods, including Fernvale Limestone of the Upper Ordovician Period and Kimmswick Limestone and Plattin Limestone of the Middle Ordovician Period. In outcrops of limestone bedrock in these areas, one or more of these formations are exposed. Lafferty, St. Clair, and Brassfield Limestones of the Silurian Period are exposed just north of the White River in the extreme southern part of Izard County. In outcrops of limestone bedrock in this area, one or more of these formations are exposed. Arkana and Moko soils formed in these areas.

The Boone Formation of the Mississippian Period caps the mountaintops and ridges above the Silurian and Ordovician limestones. This formation forms the Springfield Plateau, which is highly eroded and dissected in Izard County. The Boone Formation is of marine origin and consists of alternating beds of limestone and chert, or nodules of chert in limestone matrix. The amount of chert varies both vertically and laterally within the formation. The limestone weathers more rapidly than the chert. Noark soils, which contain large quantities of chert, formed in these areas.

Sediment deposited by the White River, Spring River, South Fork of the Spring River, Strawberry and Little Strawberry Rivers, and numerous smaller streams is the parent material of soils on terraces and flood plains. This alluvium is a mixture of material derived from many different kinds of soil, rock, and unconsolidated material. It was transported by running water from uplands in Fulton and Izard Counties, from counties to the west, and from southern Missouri. Sturkie, Hontas, Melvin, Secesh, Elsah, Wideman, and Peridge soils formed in this material.

relief

The relief in Fulton and Izard Counties is the result of the uplift of Paleozoic rocks and the subsequent erosion and entrenchment of streams and drainage channels into the land surface. The highest point in Fulton County is Wallace Knob, which is 1,136 feet above sea level. It is about 3 miles west of Salem in the central part of the county. The lowest point, about 360 feet above sea level, is where the Spring River leaves Fulton County north of Cherokee Village. The highest point in Izard County is Thompson Mountain, which is 1,124 feet above sea level. It is about 4 miles east of Mount Olive in the southwestern part of the county. The lowest point, about 350 feet above sea level, is where the White River leaves Izard County.

Some of the greatest differences in the soils in Fulton and Izard Counties are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. Relief ranges from nearly vertical bluffs to broad, nearly level to gently sloping areas.

Some soils on the steeper slopes, narrow ridges, and hilltops are shallow because they have lost so much material through geologic erosion. Moko and Ramsey soils are examples. In other areas of strong relief, soils formed in cherty limestone. Those soils, for example, Noark soils, contain large quantities of chert residue from weathered limestone. The chert mantle retards geologic erosion. In contrast, soils that are on gently sloping to moderately steep uplands, for example, Agnos, Gassville, and Gepp soils, have lost little soil material. These soils have coarse fragments in the upper part of the profile and are moderately deep or deep.

Portia soils formed on foot slopes in deep accumulations of material that washed or sloughed down from adjacent higher slopes. Peridge soils, which are on gently sloping stream terraces, formed in deep, loamy material that washed from uplands and was deposited on stream flood plains before the streams were further entrenched.

The flood plains along streams in the survey area are level to nearly level and are subject to frequent flooding unless they are protected by upstream flood-retarding structures. Sturkie, Secesh, and Wideman soils formed in these areas in deep silty, loamy, or sandy alluvial deposits.

time

The length of time required for soils to form depends largely on other factors of soil formation. Generally, less time is required if the climate is warm and humid and the vegetation luxuriant. If other factors are equal, less time is required if the parent material is loamy than if it is clayey.

In terms of geologic time, most of the soils in Fulton and Izard Counties are old, regardless of whether they are on hilltops, hillsides, or stream terraces. The young soils formed either in alluvium along streams or in residual material where geologic erosion has nearly kept pace with weathering of the bedrock.

The upland soils formed in material that weathered from rocks of Ordovician to Mississippian age. Most of these soils are old. Most of the cations have been leached out, and the reaction is strongly acid or very strongly acid. There has been considerable weathering and translocation of clay, and the horizons are clearly expressed. Iron, as well as clay, has been translocated from the A horizon to the B horizon and then oxidized, giving the B horizon stronger red, brown, and yellow colors than the A horizon. Gepp, Agnos, and Gassville soils clearly show the effect of time acting with other soil-forming factors on parent material.

Wideman soils are an example of very young soils. They formed in recent alluvium on the narrow flood plains of the smaller streams in Izard County. No definite horizons have formed below the A horizon. Instead, these soils still have the depositional bedding planes and have no soil structure. Base saturation is high, and the reaction is neutral to moderately alkaline, which indicates that leaching has been slight. The content of organic matter decreases irregularly with increasing depth. Except for the slight changes caused by worms and roots, there is little evidence of soil-forming activity.

Secesh and Sturkie soils are examples of soils of intermediate age. They formed in loamy alluvium on the flood plains of large streams. Horizonation is weakly expressed, and there is little evidence of clay translocation. The B horizon is underlain by stratified beds of silt loam, silty clay loam, and gravel.

soil horizon differentiation

The effects of the soil-forming factors are reflected in the soil profile, which is a succession of layers, or horizons, from the surface down to the parent material. The parent material has been little altered by soil-forming processes. The horizons differ in one or more properties, such as color, texture, structure, consistence, porosity, and reaction.

Most soil profiles contain three major horizons. These are called the A, B, and C horizons. Very young soils do not have a B horizon.

The horizon of maximum accumulation of organic matter is called the A1 horizon, or the surface layer. The horizon of maximum leaching of dissolved or suspended materials is called the A2 horizon, or the subsurface layer.

The B horizon lies immediately below the A horizon and is sometimes called the subsoil (*13*). It is the horizon of maximum accumulation of dissolved or suspended materials, such as iron and clay. Commonly, the B horizon has blocky structure and is firmer than the horizons immediately above or below it.

The C horizon lies below the B horizon. It typically has been little affected by the soil-forming processes, though it is in some places materially modified by weathering. In some young soils, the C horizon has been only slightly modified by living organisms and by weathering, and it immediately underlies the A horizon.

In the survey area, several processes have been active in the formation of soil horizons. Among these processes are the accumulation of organic matter, the leaching of carbonates and bases, the oxidation or reduction and transfer of iron, and the formation and translocation of silicate clay minerals. In most of the soils, more than one of these processes was involved.

The physical weathering of rocks, through heating and cooling and wetting and drying, slowly breaks them into small pieces that form the parent material for the residual soils. This is most evident in Moko and Ramsey soils.

The accumulation of organic matter in the upper part of the profile (A1 horizon) is readily evident in the Agnos soils. These soils have a light-colored subsurface layer from which organic matter, clay, and iron oxides have been removed.

Leaching of carbonates and bases has occured to some degree in nearly all the soils in the survey area. Generally, bases are leached downward in soils before silicate clay minerals begin to move. Most of the soils in the survey are strongly leached. Hontas and Sturkie soils are moderately leached, and Moko soils are only slightly leached.

Oxidation of iron is evident in moderately well drained and well drained soils, for example, Brockwell, Doniphan, and Portia soils on uplands and Peridge soils on terraces. A red and brown B horizon is an indication of the oxidation of iron.

The translocation of silicate clay minerals has contributed to horizon development in most of the soils in the two counties. In the few areas where the soils are or have been cultivated, most of the eluviated A2 horizon has been destroyed. Where it remains, however, the A2 horizon has blocky to platy structure, has less clay than the lower horizons, and is lighter colored than the rest of the soil. Clay films generally have accumulated in pores and on surfaces of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before the translocation of silicate clay occurred. Arkana and Boden soils are examples of the effects of these processes.

In Fulton and Izard Counties, leaching of bases and translocation of silicate clay are among the most important processes of horizon differentiation in the soils.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor

drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B

horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that is does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1964-77 at Calico Rock, Arkansas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	48.7	23.2	36.0	77	-3	18	2.60	1.07	3.83	5	1.4
February	53.2	26.3	39.8	76	5	0	2.59	1.69	3.40	5	.9
March	62.6	34.1	48.2	86	13	147	4.48	1.93	6.55	7	1.2
April	74.2	44.6	59.4	91	22	294	4.45	2.31	6.19	7	.0
May	81.3	51.5	66.4	95	32	508	3.92	1.83	5.61	6	.0
June	88.9	59.8	74.4	100	43	732	3.56	1.64	5.12	6	.0
July	93.4	63.7	78.6	105	47	887	3.25	2.16	4.24	6	.0
August	90.4	61.5	76.0	102	46	806	3.83	2.12	5.21	5	.0
September	83.2	56.3	69.8	98	34	594	5.03	2.26	7.28	7	.0
October	73.9	42.5	58.2	93	24	266	3.23	.74	5.17	4	.0
November	60.8	35.3	48.1	80	9	103	3.86	1.64	5.65	6	.8
December	51.4	27.7	39.6	75	5	8	4.04	1.99	5.71	6	.9
Yearly:											
Average	71.8	43.9	57.9	---	---	---	---	---	---	---	---
Extreme	---	---	---	105	-3	---	---	---	---	---	---
Total	---	---	---	---	---	4,363	44.84	36.78	52.49	70	5.2

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1964-77 at Calico Rock, Arkansas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 9	April 15	May 6
2 years in 10 later than--	April 5	April 12	April 30
5 years in 10 later than--	March 28	April 5	April 18
First freezing temperature in fall:			
1 year in 10 earlier than--	October 28	October 14	October 2
2 years in 10 earlier than--	November 1	October 19	October 6
5 years in 10 earlier than--	November 9	October 27	October 13

TABLE 3.--GROWING SEASON

[Recorded in the period 1964-77 at Calico Rock, Arkansas]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	207	189	160
8 years in 10	213	194	166
5 years in 10	226	204	177
2 years in 10	238	214	188
1 year in 10	245	220	194

TABLE 4.--NUMBER AND SIZE OF FARMS IN SELECTED YEARS

Farms	Fulton County		Izard County	
	1969	1974	1969	1974
Number of farms	752	738	693	680
Average size of farms	301	287	253	262
Acres in farms	226,015	211,889	175,269	177,983
Percent of county land in farms	58.0	54.4	47.8	48.5

TABLE 5.--NUMBER OF LIVESTOCK AND POULTRY IN SELECTED YEARS

Livestock and poultry	Fulton County		Izard County	
	1969	1974	1969	1974
Cattle and calves	39,940	50,715	29,205	37,537
Pigs and hogs	32,502	34,319	12,129	13,178
Horses and ponies	519	520	713	431
Broiler chickens	84	699	3,078,386	5,100,244

TABLE 6.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Fulton County	Izard County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
1	Agnos very cherty silt loam, 3 to 8 percent slopes	41,600	10,056	51,656	6.8
2	Agnos very cherty silt loam, 8 to 20 percent slopes	42,335	10,696	53,031	7.0
3	Arkana-Moko complex, 3 to 8 percent slopes	13,988	7,904	21,892	2.9
4	Arkana-Moko complex, 8 to 20 percent slopes	15,115	25,298	40,413	5.3
5	Arkana-Moko complex, 20 to 40 percent slopes	223	12,255	12,478	1.6
6	Boden gravelly sandy loam, 3 to 8 percent slopes	0	7,386	7,386	1.0
7	Boden gravelly sandy loam, 8 to 20 percent slopes	0	9,857	9,857	1.3
8	Brockwell fine sandy loam, 3 to 8 percent slopes	4,501	24,483	28,984	3.8
9	Brockwell fine sandy loam, 8 to 12 percent slopes, eroded	376	21,931	22,307	2.9
10	Brockwell gravelly sandy loam, 3 to 8 percent slopes	16,034	28,094	44,128	5.8
11	Brockwell gravelly sandy loam, 8 to 20 percent slopes	27,297	45,837	73,134	9.6
12	Captina silt loam, 3 to 8 percent slopes	3,032	1,027	4,059	0.5
13	Estate-Portia-Moko association, rolling	0	39,021	39,021	5.1
14	Estate-Portia-Moko association, steep	0	12,914	12,914	1.7
15	Gassville very cherty silt loam, 8 to 20 percent slopes	61,737	7,869	69,606	9.2
16	Gassville-Doniphan complex, 3 to 8 percent slopes	37,317	3,529	40,846	5.4
17	Gepp very cherty silt loam, 3 to 8 percent slopes	34,762	797	35,559	4.7
18	Gepp very cherty silt loam, 8 to 20 percent slopes	56,143	507	56,650	7.5
19	Hontas silt loam, frequently flooded	2,754	6,349	9,103	1.2
20	Melvin silt loam, frequently flooded	583	857	1,440	0.2
21	Moko-Rock outcrop complex, 20 to 50 percent slopes	0	1,407	1,407	0.2
22	Noark very cherty silt loam, 3 to 8 percent slopes	0	2,686	2,686	0.4
23	Noark very cherty silt loam, 8 to 20 percent slopes	0	11,730	11,730	1.5
24	Noark very cherty silt loam, 20 to 40 percent slopes	0	15,423	15,423	2.0
25	Peridge silt loam, 3 to 8 percent slopes	7,338	6,610	13,948	1.8
26	Portia sandy loam, 3 to 8 percent slopes, eroded	0	13,623	13,623	1.8
27	Portia sandy loam, 8 to 12 percent slopes, eroded	0	12,540	12,540	1.6
28	Ramsey-Rock outcrop complex, 3 to 15 percent slopes	0	10,970	10,970	1.4
29	Ramsey-Rock outcrop complex, 15 to 40 percent slopes	0	2,713	2,713	0.4
30	Secesh and Elsah soils, frequently flooded	7,115	886	8,001	1.1
31	Sturkie silt loam, occasionally flooded	0	4,995	4,995	0.7
32	Sturkie silt loam, frequently flooded	14,203	308	14,511	1.9
33	Wideman fine sand, frequently flooded	0	4,592	4,592	0.6
	Small water areas[1]	2,923	1,890	4,813	0.6
	Large water areas[2]	1,664	2,240	3,904	0.5
	Total	391,040	369,280	760,320	100.0

[1]Enclosed areas of water less than 40 acres in size and streams, sloughs, and canals less than one-eighth of a statute mile in width.

[2]Enclosed areas of water more than 40 acres in size and streams, sloughs, and canals more than one-eighth of a statute mile in width.

TABLE 7.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Oats	Tall fescue	Improved bermudagrass
	Bu	Bu	AUM*	AUM*
1--Agnos	55	50	5.0	5.0
2--Agnos	---	---	4.5	4.5
3--Arkana-Moko	---	---	3.5	---
4--Arkana-Moko	---	---	3.0	---
5--Arkana-Moko	---	---	---	---
6--Boden	50	50	5.0	---
7--Boden	---	---	4.5	---
8--Brockwell	60	60	5.5	6.0
9--Brockwell	55	---	5.0	6.0
10--Brockwell	60	60	5.5	6.0
11--Brockwell	---	---	4.5	5.0
12--Captina	60	60	7.0	6.5
13:				
Estate	---	---	5.0	---
Portia	---	---	5.5	5.5
Moko	---	---	---	---
14:				
Estate	---	---	---	---
Portia	---	---	---	---
Moko	---	---	---	---
15--Gassville	---	---	4.5	4.5
16--Gassville-Doniphan	55	50	5.5	5.5
17--Gepp	60	---	5.5	5.0
18--Gepp	---	---	5.0	4.5
19--Hontas	80	---	7.5	8.5

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Tall fescue	Improved bermudagrass
	Bu	Bu	AUM*	AUM*
20--Melvin	---	---	5.0	7.0
21--Moko-Rock outcrop	---	---	---	---
22--Noark	55	50	6.5	6.0
23--Noark	---	---	5.5	5.0
24--Noark	---	---	---	---
25--Peridge	75	60	7.5	7.5
26--Portia	70	60	6.5	7.0
27--Portia	---	50	6.0	6.0
28--Ramsey-Rock outcrop	---	---	---	---
29--Ramsey-Rock outcrop	---	---	---	---
30--Secesh and Elsah	---	---	6.0	7.0
31--Sturkie	95	70	8.5	9.0
32--Sturkie	80	---	8.5	9.0
33--Wideman	---	---	4.0	5.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
1, 2---------- Agnos	4o1	Slight	Slight	Slight	Southern red oak-------	60	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar-------	40	
					Loblolly pine----------	65	
					Shortleaf pine---------	60	
3*:							
Arkana----------	5c8	Slight	Slight	Moderate	Shortleaf pine---------	55	Shortleaf pine, eastern redcedar.
					Southern red oak-------	55	
					Eastern redcedar-------	35	
					White oak--------------	---	
Moko----------	5x3	Moderate	Severe	Moderate	Eastern redcedar-------	30	Eastern redcedar.
4*:							
Arkana----------	5c8	Slight	Moderate	Moderate	Shortleaf pine---------	55	Shortleaf pine, eastern redcedar.
					Southern red oak-------	55	
					Eastern redcedar-------	35	
					White oak--------------	---	
Moko----------	5x3	Severe	Severe	Severe	Eastern redcedar-------	30	Eastern redcedar.
5*:							
Arkana----------	5c9	Moderate	Severe	Severe	Shortleaf pine---------	55	Shortleaf pine, eastern redcedar.
					Southern red oak-------	55	
					Eastern redcedar-------	35	
					White oak--------------	---	
Moko----------	5x3	Severe	Severe	Severe	Eastern redcedar-------	30	Eastern redcedar.
6, 7---------- Boden	4o7	Slight	Slight	Slight	Southern red oak-------	65	Shortleaf pine, loblolly pine, eastern redcedar, black walnut, black locust, southern red oak.
					Eastern redcedar-------	40	
					Black walnut-----------	---	
					Shortleaf pine---------	60	
					Black locust-----------	---	
					White oak--------------	---	
					Black cherry-----------	---	
					Loblolly pine----------	---	
8, 9, 10, 11------- Brockwell	3o7	Slight	Slight	Slight	Shortleaf pine---------	70	Shortleaf pine, loblolly pine.
					Southern red oak-------	65	
					Black oak--------------	---	
					White oak--------------	---	
12---------- Captina	4o7	Slight	Slight	Slight	Shortleaf pine---------	60	Shortleaf pine, loblolly pine, eastern redcedar, black walnut, black locust, southern red oak.
					Southern red oak-------	65	
					Eastern redcedar-------	40	
					Black locust-----------	---	
					Black walnut-----------	---	
13*:							
Estate----------	4x8	Moderate	Moderate	Slight	Southern red oak-------	65	Shortleaf pine, loblolly pine, eastern redcedar.
					Eastern redcedar-------	40	
					Black walnut-----------	---	
					Shortleaf pine---------	60	
					Black locust-----------	---	
					White oak--------------	---	
					Black cherry-----------	---	
Portia----------	3r8	Moderate	Slight	Slight	Sweetgum---------------	80	Loblolly pine, shortleaf pine, black walnut.
					Loblolly pine----------	75	
					Shortleaf pine---------	---	
					Northern red oak-------	---	
Moko----------	5x3	Severe	Severe	Severe	Eastern redcedar-------	30	Eastern redcedar.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
14*:							
Estate	4x9	Severe	Severe	Slight	Southern red oak	65	Shortleaf pine, loblolly pine, eastern redcedar.
					Eastern redcedar	40	
					Black walnut	---	
					Shortleaf pine	60	
					Black locust	---	
					White oak	---	
					Black cherry	---	
Portia	3r9	Severe	Severe	Slight	Sweetgum	80	Loblolly pine, shortleaf pine, black walnut.
					Loblolly pine	75	
					Shortleaf pine	---	
					Northern red oak	---	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
15 Gassville	4o7	Slight	Slight	Slight	Shortleaf pine	55	Shortleaf pine, eastern redcedar, loblolly pine, black locust, southern red oak.
					Southern red oak	65	
					Black locust	---	
					Black walnut	---	
					Black cherry	---	
					Eastern redcedar	35	
16*:							
Gassville	4o7	Slight	Slight	Slight	Shortleaf pine	55	Shortleaf pine, eastern redcedar, loblolly pine, black locust, southern red oak.
					Southern red oak	65	
					Black locust	---	
					Black walnut	---	
					Black cherry	---	
					Eastern redcedar	35	
Doniphan	4o7	Slight	Slight	Slight	White oak	65	Shortleaf pine, white oak, sweetgum, black oak.
					Shortleaf pine	60	
17, 18 Gepp	3o7	Slight	Slight	Slight	White oak	70	Black walnut, loblolly pine, shortleaf pine.
					Shortleaf pine	75	
					Loblolly pine	80	
					Black oak	70	
					Northern red oak	70	
19 Hontas	2w8	Slight	Moderate	Moderate	Shortleaf pine	80	Shortleaf pine, black walnut, loblolly pine, eastern cottonwood, sycamore, Shumard oak, sweetgum.
					Shumard oak	80	
					Sweetgum	80	
					Eastern cottonwood	80	
					Sycamore	75	
					Black walnut	---	
					Water oak	---	
20 Melvin	1w6	Slight	Severe	Severe	Sweetgum	---	Eastern cottonwood, American sycamore.
					Eastern cottonwood	---	
					Sycamore	---	
21*:							
Moko	5x3	Severe	Severe	Severe	Eastern redcedar	30	Eastern redcedar.
Rock outcrop.							
22, 23 Noark	4f8	Slight	Slight	Moderate	Shortleaf pine	60	Shortleaf pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
24---------- Noark	4f9	Moderate	Severe	Moderate	Shortleaf pine--------- Eastern redcedar------- Southern red oak------- White oak-----------	60 40 60 ---	Shortleaf pine, eastern redcedar, southern red oak.
25---------- Peridge	3o7	Slight	Slight	Slight	Shortleaf pine--------- Southern red oak------- Eastern redcedar------- Black walnut---------- White oak---------- White ash---------- Black cherry---------- Black locust----------	70 70 50 --- --- --- --- ---	Shortleaf pine, loblolly pine, black walnut, black locust, southern red oak, white ash.
26, 27---------- Portia	3o7	Slight	Slight	Slight	Sweetgum---------- Loblolly pine---------- Shortleaf pine--------- Northern red oak-------	80 75 ---	Loblolly pine, shortleaf pine, black walnut.
28*, 29*: Ramsey----------	5x9	Severe	Severe	Severe	White oak---------- Shortleaf pine--------- Loblolly pine---------- Eastern redcedar-------	50 55 --- 30	Shortleaf pine, loblolly pine, eastern redcedar, white oak.
Rock outcrop.							
30*: Secesh----------	4o7	Slight	Slight	Slight	White oak---------- Shortleaf pine--------- American sycamore------ Black walnut---------- Black oak----------	60 --- --- --- ---	Black walnut, shortleaf pine, American sycamore.
Elsah----------	3f5	Slight	Slight	Moderate	Eastern cottonwood----- American sycamore------ Sweetgum---------- Red maple----------	95 --- --- ---	Black walnut, green ash, sweetgum.
31, 32---------- Sturkie	2o4	Slight	Slight	Slight	Southern red oak------- White oak---------- American sycamore------ Eastern cottonwood-----	80 70 80 100	Northern red oak, white oak, American sycamore, eastern cottonwood, black walnut.
33---------- Wideman	3s8	Slight	Moderate	Moderate	Sweetgum---------- Eastern cottonwood----- American sycamore------	80 90 80	Eastern cottonwood, American sycamore, loblolly pine, shortleaf pine, sweetgum.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Agnos	Severe: percs slowly, small stones.	Severe: percs slowly, small stones.	Severe: small stones, percs slowly.	Slight.
2 Agnos	Severe: percs slowly, small stones.	Severe: percs slowly, small stones.	Severe: slope, small stones, percs slowly.	Severe: erodes easily.
3*: Arkana	Severe: percs slowly, small stones.	Severe: percs slowly, small stones.	Severe: percs slowly, small stones.	Slight.
Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, small stones, depth to rock.	Severe: large stones.
4*: Arkana	Severe: percs slowly, small stones.	Severe: percs slowly, small stones.	Severe: percs slowly, slope, small stones.	Severe: erodes easily.
Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
5*: Arkana	Severe: slope, percs slowly, small stones.	Severe: slope, small stones, percs slowly.	Severe: percs slowly, slope, small stones.	Severe: slope, erodes easily.
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
6 Boden	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Moderate: small stones, slope.	Slight.
7 Boden	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope.	Slight.
8 Brockwell	Slight	Slight	Moderate: slope, small stones.	Slight.
9 Brockwell	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
10 Brockwell	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
11 Brockwell	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
12 Captina	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
13*:				
Estate	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope, small stones.	Moderate: large stones.
Portia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
14*:				
Estate	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
15--- Gassville	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily.
16*:				
Gassville	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Slight.
Doniphan	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
17--- Gepp	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight.
18--- Gepp	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight.
19--- Hontas	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Moderate: floods.
20--- Melvin	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
21*:				
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Rock outcrop.				
22--- Noark	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight.
23--- Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
24--- Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
25--- Peridge	Slight---	Slight---	Moderate: slope.	Slight.
26--- Portia	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
27--- Portia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
28*: Ramsey---	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight.
Rock outcrop.				
29*: Ramsey---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop.				
30*: Secesh---	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Elsah---	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
31--- Sturkie	Severe: floods.	Slight---	Moderate: floods.	Slight.
32--- Sturkie	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
33--- Wideman	Severe: floods, too sandy.	Moderate: floods.	Severe: floods.	Moderate: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1, 2---------- Agnos	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
3*: Arkana----------	Fair	Good	Fair	Good	---	Poor	Very poor.	Fair	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
4*: Arkana----------	Fair	Good	Fair	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
5*: Arkana----------	Very poor.	Fair	Fair	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
6---------- Boden	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
7---------- Boden	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
8---------- Brockwell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
9---------- Brockwell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10---------- Brockwell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
11---------- Brockwell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
12---------- Captina	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
13*: Estate----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Portia----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
14*: Estate----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Portia----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Moko----------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
15---------- Gassville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16*: Gassville----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Doniphan----------	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
17, 18---------- Gepp	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
19---------- Hontas	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor
20---------- Melvin	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
21*: Moko----------	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Rock outcrop.										
22, 23---------- Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
24---------- Noark	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
25---------- Peridge	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
26---------- Portia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
27---------- Portia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
28*, 29*: Ramsey----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.										
30*: Secesh----------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Elsah----------	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
31---------- Sturkie	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
32---------- Sturkie	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
33---------- Wideman	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1---------- Agnos	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
2---------- Agnos	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.
3*: Arkana----------	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
4*: Arkana----------	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
5*: Arkana----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Moko----------	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
6---------- Boden	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
7---------- Boden	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.
8---------- Brockwell	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
9---------- Brockwell	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
10---------- Brockwell	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
11---------- Brockwell	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
12---------- Captina	Moderate: too clayey, wetness.	Moderate: wetness.	Severe: shrink-swell, wetness.	Moderate: slope, wetness.	Severe: low strength.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
13*:					
Estate	Moderate: depth to rock, slope.	Moderate: slope, shrink-swell.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.
Portia	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
14*:					
Estate	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Portia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
15--- Gassville	Moderate: too clayey, slope, depth to rock.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
16*:					
Gassville	Moderate: too clayey, depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Doniphan	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
17--- Gepp	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
18--- Gepp	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
19--- Hontas	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
20--- Melvin	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.
21*:					
Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
Rock outcrop.					
22--- Noark	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
23---------- Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
24---------- Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
25---------- Peridge	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.
26---------- Portia	Slight----------	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength.
27---------- Portia	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.
28*: Ramsey----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Rock outcrop.					
29*: Ramsey----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
30*: Secesh----------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Elsah----------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
31, 32---------- Sturkie	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
33---------- Wideman	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1---------- Agnos	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
2---------- Agnos	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
3*: Arkana----------	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
4*: Arkana----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
5*: Arkana----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Moko----------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
6---------- Boden	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
7---------- Boden	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
8---------- Brockwell	Slight----------	Moderate: seepage, slope.	Slight----------	Slight----------	Fair: small stones.
9---------- Brockwell	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
10---------- Brockwell	Slight----------	Severe: seepage.	Slight----------	Severe: seepage.	Fair: small stones.
11---------- Brockwell	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Fair: small stones, slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12---------- Captina	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
13*: Estate----------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: slope, depth to rock.	Poor: too clayey, hard to pack.
Portia----------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Moko----------	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
14*: Estate----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Portia----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Moko----------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
15---------- Gassville	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
16*: Gassville----------	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Doniphan----------	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
17---------- Gepp	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
18---------- Gepp	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
19---------- Hontas	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.
20---------- Melvin	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
21*:					
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
Rock outcrop.					
22 Noark	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, small stones.
23 Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
24 Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
25 Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
26 Portia	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
27 Portia	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
28*:					
Ramsey	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Rock outcrop.					
29*:					
Ramsey	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
30*:					
Secesh	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
Elsah	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: seepage, small stones.
31, 32 Sturkie	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
33 Wideman	Severe: floods.	Severe: floods, seepage.	Severe: seepage, floods.	Severe: floods, seepage.	Poor: seepage.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1, 2---------- Agnos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
3*, 4*: Arkana----------	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too clayey.
Moko----------	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
5*: Arkana----------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope, too clayey.
Moko----------	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
6, 7---------- Boden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
8---------- Brockwell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
9---------- Brockwell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
10, 11---------- Brockwell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
12---------- Captina	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
13*: Estate----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Portia----------	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Moko----------	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
14*:				
Estate	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Portia	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
15--- Gassville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
16*:				
Gassville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Doniphan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
17, 18--- Gepp	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
19--- Hontas	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
20--- Melvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
21*:				
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
22, 23--- Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
24--- Noark	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
25--- Peridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
26--- Portia	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
27--- Portia	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
28*:				
Ramsey	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
29*:				
Ramsey	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
30*:				
Secesh	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Elsah	Fair: large stones.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
31, 32 Sturkie	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
33 Wideman	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1---------- Agnos	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
2---------- Agnos	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
3*: Arkana----------	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Large stones, depth to rock, percs slowly.	Large stones, depth to rock, erodes easily.
Moko----------	Severe: depth to rock.	Severe: large stones, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
4*: Arkana----------	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Moko----------	Severe: depth to rock.	Severe: large stones, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
5*: Arkana----------	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Moko----------	Severe: depth to rock, slope.	Severe: large stones, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
6---------- Boden	Moderate: seepage, depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Slope----------	Favorable------	Favorable.
7---------- Boden	Moderate: seepage, depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Slope----------	Slope----------	Slope.
8, 10---------- Brockwell	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
9, 11---------- Brockwell	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
12---------- Captina	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Slope, percs slowly, rooting depth.	Rooting depth, wetness, erodes easily.	Erodes easily, rooting depth, percs slowly.
13*: Estate----------	Moderate: depth to rock.	Moderate: hard to pack, thin layer.	Deep to water	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Portia----------	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
Moko----------	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
14*:						
Estate	Severe: slope.	Moderate: hard to pack, thin layer.	Deep to water	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Portia	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Moko	Severe: depth to rock, slope.	Severe: large stones, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
15--Gassville	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
16*:						
Gassville	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Large stones, erodes easily.	Large stones, erodes easily.
Doniphan	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Droughty, slope.	Favorable	Droughty.
17--Gepp	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Droughty, slope.	Favorable	Droughty.
18--Gepp	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
19--Hontas	Moderate: seepage.	Severe: piping.	Floods	Wetness, erodes easily, floods.	Erodes easily, wetness.	Favorable.
20--Melvin	Moderate: seepage.	Severe: piping, wetness.	Floods	Wetness, erodes easily, floods.	Erodes easily, wetness.	Wetness.
21*:						
Moko	Severe: depth to rock, slope.	Severe: large stones, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
22--Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Favorable	Droughty.
23--Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
24--Noark	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
25--Peridge	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
26--Portia	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
27---------- Portia	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
28*: Ramsey----------	Severe: depth to rock.	Severe: piping, thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
29*: Ramsey----------	Severe: depth to rock, slope.	Severe: piping, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
30*: Secesh----------	Severe: seepage.	Slight---------	Deep to water	Floods---------	Favorable------	Favorable.
Elsah----------	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Floods---------	Large stones, erodes easily.	Large stones, erodes easily.
31, 32---------- Sturkie	Moderate: seepage.	Severe: piping.	Deep to water	Floods, erodes easily.	Erodes easily	Favorable.
33---------- Wideman	Severe: seepage.	Severe: piping, seepage.	Deep to water	Floods, fast intake.	Too sandy------	Droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils have Unified classifications and USDA textures that are supplementary to those shown. In general, the dominant classifications and textures are shown, and the others are inferred]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1, 2---------- Agnos	0-10	Very cherty silt loam.	GM, SM, ML	A-1, A-2, A-4	5-10	25-65	20-60	15-60	15-60	<20	NP-3
	10-34	Clay----------	MH, CH	A-7	0	90-100	80-100	80-100	70-100	55-75	20-40
	34-57	Clay, silty clay	MH, CH	A-7	0	85-100	80-100	80-100	75-100	60-80	25-45
	57-72	Weathered bedrock	---	---	---	---	---	---	---	---	---
3*:											
Arkana----------	0-10	Very cherty silt loam.	SM, SC, SM-SC, GM	A-4, A-2, A-1, A-6	20-30	25-65	20-60	15-60	15-40	<25	NP-15
	10-16	Very cherty silty clay, very cherty clay.	GC, SC, CL, CH	A-2, A-7	15-30	30-60	25-60	25-55	25-55	40-65	20-35
	16-28	Clay, cherty clay	CH	A-7	0-10	70-90	70-80	65-85	60-80	51-80	31-50
	28-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Moko----------	0-10	Very stony clay loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4*, 5*:											
Arkana----------	0-7	Very cherty silt loam.	SM, SC, SM-SC, GM	A-4, A-2, A-1, A-6	20-30	25-65	20-60	15-60	15-40	<25	NP-15
	7-16	Very cherty silty clay, very cherty clay.	GC, SC, CL, CH	A-2, A-7	15-30	30-60	25-60	25-55	25-55	40-65	20-35
	16-28	Clay, cherty clay	CH	A-7	0-10	70-90	70-80	65-85	60-80	51-80	31-50
	28-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Moko----------	0-10	Very stony clay loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
6, 7---------- Boden	0-7	Gravelly sandy loam.	ML, SM, GM	A-2, A-4	0	65-100	65-85	55-75	20-55	---	NP
	7-12	Sandy clay loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0	85-100	85-100	75-90	30-60	<25	NP-7
	12-48	Sandy clay, clay	CH, CL	A-6, A-7	0	85-100	85-100	75-90	55-80	35-55	15-30
	48-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	50-52	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8, 9---------- Brockwell	0-6	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2	0	95-100	75-100	60-95	30-60	<20	NP-5
	6-17	Sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2	0	95-100	75-100	60-95	30-60	<15	NP-5
	17-53	Fine sandy loam, sandy loam, sandy clay loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0	95-100	60-100	50-95	30-60	<20	NP-5
	53-80	Fine sandy loam, sandy loam, gravelly sandy clay loam.	SM, SM-SC	A-4, A-2	0	85-100	55-90	40-75	25-45	<25	NP-7

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
10, 11---------- Brockwell	0-17	Gravelly sandy loam.	SM, SM-SC	A-4, A-2, A-1	0	80-95	50-80	40-70	20-45	<20	NP-5
	17-53	Fine sandy loam, sandy loam, sandy clay loam.	SM, ML, CL-ML, SM-SC	A-4, A-2	0	95-100	60-100	50-95	30-60	<20	NP-5
	53-80	Fine sandy loam, sandy loam, gravelly sandy clay loam.	SM, SM-SC	A-4, A-2	0	85-100	55-90	40-75	25-45	<25	NP-7
12---------- Captina	0-9	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-100	75-95	<25	NP-7
	9-20	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-100	80-90	20-40	5-20
	20-28	Cherty silty clay loam, cherty silt loam.	CL-ML, CL, SM-SC-SC	A-4, A-6	5-15	80-95	70-90	65-90	45-85	20-40	5-20
	28-46	Very cherty silty clay loam, very cherty silty clay.	CL, GC, SC	A-6, A-7	5-45	60-95	55-90	45-90	40-85	30-50	15-30
	46-72	Clay, silty clay, cherty clay.	CL, CH	A-6, A-7	0-10	70-100	70-95	70-95	65-90	30-55	15-30
13*, 14*: Estate----------	0-7	Stony sandy loam	SM	A-2, A-4	10-30	75-95	60-80	55-75	20-50	<20	NP-3
	7-13	Sandy loam, clay loam, sandy clay loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	0-20	80-95	70-90	40-80	30-60	<25	NP-5
	13-37	Clay, sandy clay, gravelly clay loam.	CH, CL	A-6, A-7	0-15	80-95	80-95	70-90	55-80	35-55	15-30
	37-48	Clay, sandy clay loam, gravelly clay loam.	CL, SC	A-4, A-6	0-20	80-100	75-100	65-90	35-70	25-40	10-20
	48-50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Portia----------	0-7	Sandy loam-------	SM, ML	A-2, A-4	0	90-100	85-100	70-85	35-60	---	NP
	7-30	Loam, sandy loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	90-100	85-100	75-95	65-80	18-30	3-12
	30-51	Clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	90-100	85-100	80-95	65-85	25-40	8-20
	51-80	Sandy clay, clay loam, clay.	CL, CH, SC	A-4, A-6, A-7	0	90-100	85-100	80-95	36-75	25-55	8-30
Moko----------	0-10	Very stony clay loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
15---------- Gassville	0-9	Very cherty silt loam.	GM, GM-GC, GP-GM	A-1, A-2	10-30	25-65	20-60	15-50	10-35	<25	NP-5
	9-23	Cherty clay, clay, silty clay	CH, MH	A-7	0-10	70-100	70-100	65-100	55-98	55-80	27-47
	23-40	Clay, cherty clay	CH, MH	A-7	0-10	85-100	70-100	65-100	60-98	55-80	27-47
	40-58	Weathered bedrock	---	---	---	---	---	---	---	---	---
	58-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
16*: Gassville--------	0-9	Very cherty silt loam.	GM, GM-GC, GP-GM	A-1, A-2	10-30	25-65	20-60	15-50	10-35	<25	NP-5
	9-23	Cherty clay, clay, silty clay	CH, MH	A-7	0-10	70-100	70-100	65-100	55-98	55-80	27-47
	23-40	Clay, cherty clay	CH, MH	A-7	0-10	85-100	70-100	65-100	60-98	55-80	27-47
	40-58	Weathered bedrock	---	---	---	---	---	---	---	---	---
	58-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
16*:											
Doniphan	0-19	Very cherty silt loam.	CL-ML, GM, GM-GC, SM-SC	A-4, A-2	5-30	50-80	45-70	45-65	35-60	20-30	2-8
	19-30	Cherty clay, clay	CH, MH	A-7	0-5	70-100	60-100	55-100	50-90	51-70	25-35
	30-72	Clay	CH, MH	A-7	0-5	90-100	90-100	85-100	70-95	51-70	25-35
17, 18 Gepp	0-7	Very cherty silt loam.	GM, GC, SM-SC, SM	A-1, A-2	10-30	30-70	20-50	10-40	5-20	<30	NP-10
	7-12	Cherty silty clay loam, cherty silt loam, silty clay loam.	CL	A-6, A-4	0-15	65-100	65-100	55-95	51-90	25-40	8-20
	12-40	Clay	MH, CH	A-7	0-5	90-100	90-100	85-100	80-95	51-75	25-40
	40-75	Clay, cherty clay	MH, CH	A-7	0-15	70-100	70-100	65-100	60-95	51-75	25-40
19 Hontas	0-11	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	80-90	<25	NP-7
	11-72	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-95	20-35	5-15
20 Melvin	0-6	Silt loam	CL, CL-ML, ML	A-4	0	95-100	90-100	80-100	80-95	25-35	4-10
	6-45	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	80-95	25-40	5-20
	45-72	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	85-100	80-100	70-100	60-95	25-40	5-20
21*:											
Moko	0-10	Very stony clay loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
22, 23, 24 Noark	0-10	Very cherty silt loam.	GM	A-2, A-1, A-4	0-5	20-50	20-50	20-50	15-45	<20	NP-3
	10-16	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0-5	20-50	20-50	20-50	15-45	20-35	5-15
	16-72	Very cherty clay, very cherty silty clay.	GC	A-2, A-7	5-10	20-50	20-50	20-50	15-45	41-60	20-35
25 Peridge	0-20	Silt loam	ML, CL-ML	A-4	0	95-100	90-100	85-90	80-85	<20	NP-5
	20-34	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	80-95	30-40	11-20
	34-80	Silty clay, silty clay loam.	CL	A-6, A-7	0	80-100	80-100	65-90	60-85	35-50	15-25
26, 27 Portia	0-7	Sandy loam	SM, ML	A-2, A-4	0	90-100	85-100	70-85	35-60	---	NP
	7-30	Loam, sandy loam, sandy clay loam.	CL, ML, CL-ML	A-4, A-6	0	90-100	85-100	75-95	65-80	18-30	3-12
	30-51	Clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	90-100	85-100	80-95	65-85	25-40	8-20
	51-80	Sandy clay, clay loam, clay.	CL, CH, SC	A-4, A-6, A-7	0	90-100	85-100	80-95	36-75	25-55	8-30
28*:											
Ramsey	0-16	Stony sandy loam	SM, SC, ML, CL	A-4, A-2	15-30	75-90	65-85	50-75	34-65	15-25	2-8
	16-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
29*:											
Ramsey	0-13	Stony sandy loam	SM, SC, ML, CL	A-4, A-2	15-30	75-90	65-85	50-75	34-65	15-25	2-8
	13-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
30*:											
Secesh	0-12	Silt loam	ML, ML-CL, CL	A-4	0-10	85-100	80-100	75-95	60-90	20-30	NP-7
	12-30	Cherty silty clay loam, cherty sandy clay loam, cherty clay loam.	CL, GC, SC	A-6	0-10	65-90	55-80	50-75	40-65	30-40	11-20
	30-55	Cherty sandy clay, very cherty sandy clay, very cherty sandy clay loam.	GC, SC	A-6, A-2-6	10-20	45-75	35-65	25-45	20-40	30-40	11-20
	55-76	Very cherty sandy clay loam, very cherty clay loam, cherty sandy clay.	GC, SC, GP-GC, SP-SC	A-6, A-2-6	15-45	40-70	25-65	20-45	10-40	30-40	11-20
Elsah	0-8	Cherty silt loam	CL, SM, SC	A-2, A-4 A-6	0-15	85-100	70-85	60-80	55-75	22-32	8-15
	8-40	Cherty loam, very cherty loam, very cherty silt loam.	SM, ML, CL, SC	A-2, A-4	15-30	50-70	20-65	20-60	20-60	<30	NP-8
	40-72	Very cherty loam, very cherty silt loam.	GM, GP-GM	A-1, A-2	20-40	20-50	20-45	20-40	10-25	<30	NP-6
31, 32	0-28	Silt loam	CL, ML, CL-ML	A-4	0	95-100	90-100	80-100	70-90	<25	NP-7
Sturkie	28-57	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-95	20-35	5-15
	57-80	Silt loam, silty clay loam, loam.	ML, CL-ML, CL	A-4	0	95-100	85-100	80-100	70-95	<30	NP-7
33	0-6	Fine sand	SM, SP-SM	A-2, A-3	0	100	70-100	50-75	9-30	---	NP
Wideman	6-32	Sandy loam, loamy fine sand, fine sand.	SP-SM, SM	A-2, A-3	0	100	100	60-100	5-35	---	NP
	32-52	Fine sandy loam, fine sand, silt loam.	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	100	65-100	13-75	<25	NP-5
	52-63	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	80-100	70-100	50-75	5-35	---	NP
	63-80	Fine sandy loam, sandy loam, loamy fine sand.	SM, ML, SP-SM	A-2, A-4, A-3	0	95-100	95-100	65-90	10-55	<20	NP-3

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
1, 2	0-10	10-25	1.25-1.50	0.6-2.0	0.06-0.10	5.1-6.5	Low	0.43	4	2-4
Agnos	10-34	50-80	1.15-1.30	<0.06	0.12-0.18	3.6-5.5	Moderate	0.37		
	34-57	60-90	1.15-1.30	<0.06	0.12-0.18	3.6-5.5	Moderate	----		
	57-72	---	---	---	---	---	---	----		
3*:										
Arkana	0-10	15-30	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low	0.37	2	2-4
	10-16	50-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate	0.24		
	16-28	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High	0.32		
	28-30	---	---	---	---	---	---	----		
Moko	0-10	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.32	1	2-6
	10-12	---	---	---	---	---	---	----		
4*, 5*:										
Arkana	0-7	15-30	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low	0.37	2	2-4
	7-16	50-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate	0.24		
	16-28	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High	0.32		
	28-30	---	---	---	---	---	---	----		
Moko	0-10	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.32	1	2-6
	10-12	---	---	---	---	---	---	----		
6, 7	0-7	5-20	1.30-1.50	0.6-6.0	0.07-0.15	4.5-6.0	Low	0.32	3	1-3
Boden	7-12	10-35	1.30-1.50	0.6-2.0	0.09-0.17	4.5-6.0	Low	0.32		
	12-48	35-55	1.15-1.35	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.28		
	48-50	---	---	---	---	---	---	----		
	50-52	---	---	---	---	---	---	----		
8, 9	0-6	3-10	1.30-1.60	0.6-2.0	0.10-0.20	4.5-6.0	Low	0.37	5	.5-1
Brockwell	6-17	3-10	1.30-1.60	0.6-2.0	0.10-0.20	4.5-6.0	Low	0.37		
	17-53	10-20	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low	0.32		
	53-80	15-30	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.24		
10, 11	0-17	3-8	1.30-1.60	2.0-6.0	0.08-0.16	4.5-6.0	Low	0.32	5	.5-1
Brockwell	17-53	10-20	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low	0.32		
	53-80	15-30	1.30-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Low	0.24		
12	0-9	10-25	1.30-1.50	0.6-2.0	0.16-0.24	5.1-6.5	Low	0.43	4	1-2
Captina	9-20	20-35	1.30-1.50	0.6-2.0	0.16-0.24	5.1-6.5	Low	0.37		
	20-28	25-40	1.40-1.60	0.06-0.2	0.04-0.08	3.6-5.5	Low	0.32		
	28-46	35-45	1.40-1.60	0.06-0.2	0.02-0.08	3.6-5.5	High	0.32		
	46-72	40-55	1.20-1.40	0.06-0.2	0.05-0.10	3.6-5.5	High	0.32		
13*, 14*:										
Estate	0-7	5-20	1.40-1.60	0.6-6.0	0.07-0.15	5.1-7.3	Low	0.28	3	.5-2
	7-13	20-35	1.30-1.50	0.6-2.0	0.10-0.18	5.6-7.3	Low	0.32		
	13-37	35-55	1.20-1.40	0.06-0.2	0.12-0.18	5.6-7.3	Moderate	0.28		
	37-48	25-45	1.30-1.50	0.2-0.6	0.10-0.18	5.6-7.3	Moderate	0.28		
	48-50	---	---	---	---	---	---	----		
Portia	0-7	7-20	1.30-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low	0.24	3	1-3
	7-30	18-35	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low	0.32		
	30-51	20-40	1.30-1.60	0.2-0.6	0.10-0.17	4.5-6.0	Low	0.32		
	51-80	20-40	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate	0.28		
Moko	0-10	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.32	1	2-6
	10-12	---	---	---	---	---	---	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
15----------	0-9	10-25	1.25-1.50	2.0-6.0	0.06-0.10	5.1-6.5	Low----------	0.37	3	2-4
Gassville	9-23	60-80	1.15-1.45	<0.06	0.10-0.16	4.5-5.5	Moderate-----	0.32		
	23-40	60-85	1.15-1.45	<0.06	0.12-0.18	4.5-5.5	Moderate-----	0.37		
	40-58	---	---	---	---	---	----------	----		
	58-60	---	---	---	---	---	----------	----		
16*:										
Gassville-------	0-9	10-25	1.25-1.50	2.0-6.0	0.06-0.10	5.1-6.5	Low----------	0.37	3	2-4
	9-23	60-80	1.15-1.45	<0.06	0.10-0.16	4.5-5.5	Moderate-----	0.32		
	23-40	60-85	1.15-1.45	<0.06	0.12-0.18	4.5-5.5	Moderate-----	0.37		
	40-58	---	---	---	---	---	----------	----		
	58-60	---	---	---	---	---	----------	----		
Doniphan--------	0-19	18-27	1.10-1.30	2.0-6.0	0.08-0.15	4.5-6.5	Low----------	0.28	2	2-4
	19-30	48-70	1.20-1.40	0.6-2.0	0.08-0.12	3.6-5.5	Moderate-----	0.28		
	30-72	48-70	1.20-1.40	0.6-2.0	0.10-0.12	3.6-5.5	Moderate-----	0.28		
17, 18----------	0-7	10-25	1.25-1.45	0.6-2.0	0.06-0.12	5.1-6.5	Low----------	0.28	4	2-4
Gepp	7-12	25-40	1.20-1.40	0.6-2.0	0.10-0.22	4.5-6.0	Low----------	0.28		
	12-40	65-85	1.15-1.30	0.6-2.0	0.10-0.18	4.5-6.0	Moderate-----	0.28		
	40-75	65-85	1.15-1.30	0.6-2.0	0.08-0.18	5.1-6.0	Moderate-----	0.28		
19----------	0-11	10-25	1.25-1.45	0.6-2.0	0.16-0.24	5.6-7.3	Low----------	0.37	5	1-4
Hontas	11-72	15-35	1.25-1.45	0.6-2.0	0.16-0.24	5.6-7.8	Low----------	0.37		
20----------	0-6	12-17	1.20-1.60	0.6-2.0	0.18-0.23	6.1-7.8	Low----------	0.37	5	.5-4
Melvin	6-45	12-35	1.30-1.60	0.6-2.0	0.18-0.23	6.1-7.8	Low----------	0.37		
	45-72	7-35	1.40-1.70	0.6-2.0	0.16-0.23	6.1-7.8	Low----------	0.37		
21*:										
Moko----------	0-10	18-35	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low----------	0.32	1	2-6
	10-12	---	---	---	---	---	----------	----		
Rock outcrop.										
22, 23, 24-------	0-10	10-25	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.32	3	1-3
Noark	10-16	30-40	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28		
	16-72	45-75	1.20-1.50	0.6-2.0	0.09-0.13	3.6-5.5	Low----------	0.24		
25----------	0-20	10-20	1.25-1.45	0.6-2.0	0.16-0.24	4.5-6.0	Low----------	0.37	5	1-4
Peridge	20-34	20-34	1.25-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.32		
	34-80	35-60	1.15-1.35	0.6-2.0	0.19-0.18	4.5-6.0	Moderate-----	0.24		
26, 27----------	0-7	7-20	1.30-1.60	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.24	3	1-3
Portia	7-30	18-35	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.0	Low----------	0.32		
	30-51	20-40	1.30-1.60	0.2-0.6	0.10-0.17	4.5-6.0	Low----------	0.32		
	51-80	20-40	1.20-1.60	0.2-2.0	0.12-0.20	5.1-6.0	Moderate-----	0.28		
28*:										
Ramsey----------	0-16	8-25	1.20-1.40	6.0-20	0.06-0.10	4.5-5.5	Low----------	0.17	1	2-4
	16-28	---	---	---	---	---	----------	----		
Rock outcrop.										
29*:										
Ramsey----------	0-13	8-25	1.20-1.40	6.0-20	0.06-0.10	4.5-5.5	Low----------	0.17	1	2-4
	13-15	---	---	---	---	---	----------	----		
Rock outcrop.										

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cm³	In/hr	In/in	pH				Pct
30*:										
Secesh----------	0-12	15-25	1.10-1.30	0.6-2.0	0.16-0.20	5.6-6.5	Low----------	0.32	3	1-4
	12-30	25-35	1.20-1.40	0.6-2.0	0.09-0.14	4.5-6.0	Low----------	0.32		
	30-55	25-35	1.30-1.50	0.6-2.0	0.05-0.09	4.5-6.0	Low----------	0.24		
	55-76	25-40	1.30-1.50	2.0-6.0	0.03-0.08	4.5-6.0	Low----------	0.24		
Elsah----------	0-8	20-27	1.20-1.40	0.6-2.0	0.17-0.24	5.6-7.3	Low----------	0.37	3	1-4
	8-40	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17		
	40-72	5-15	1.50-1.70	2.0-6.0	0.06-0.11	5.6-7.3	Low----------	0.17		
31, 32----------	0-28	10-27	1.20-1.40	0.6-2.0	0.14-0.24	5.6-7.8	Low----------	0.37	5	2-5
Sturkie	28-57	15-35	1.20-1.40	0.6-2.0	0.16-0.24	6.1-8.4	Low----------	0.37		
	57-80	15-35	1.20-1.40	0.6-2.0	0.13-0.24	6.1-8.4	Low----------	0.37		
33----------	0-6	2-12	1.40-1.60	>6.0	0.05-0.11	3.6-6.0	Low----------	0.17	5	.5-1
Wideman	6-32	2-15	1.40-1.60	>6.0	0.06-0.14	5.1-7.3	Low----------	0.17		
	32-52	5-18	1.30-1.50	2.0-6.0	0.06-0.20	5.1-7.3	Low----------	0.20		
	52-63	2-12	1.40-1.60	>6.0	0.05-0.11	5.1-7.3	Low----------	0.17		
	63-80	5-18	1.30-1.50	2.0-6.0	0.10-0.15	5.1-7.3	Low----------	0.17		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
1, 2---------- Agnos	C	None---------	---	---	>6.0	---	---	40-60	Soft	Moderate	High.
3*, 4*, 5*: Arkana----------	C	None---------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
Moko----------	D	None---------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
6, 7---------- Boden	C	None---------	---	---	>6.0	---	---	40-60	Hard	Moderate	High.
8, 9, 10, 11------ Brockwell	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
12---------- Captina	C	None---------	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High-----	High.
13*, 14*: Estate----------	C	None---------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Portia----------	C	None---------	---	---	>6.0	---	---	>60	---	High-----	High.
Moko----------	D	None---------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
15---------- Gassville	C	None---------	---	---	>6.0	---	---	40-60	Hard	High-----	Moderate.
16*: Gassville--------	C	None---------	---	---	>6.0	---	---	40-60	Hard	High-----	Moderate.
Doniphan---------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High.
17, 18---------- Gepp	B	None---------	---	---	>6.0	---	---	>60	---	High-----	High.
19---------- Hontas	B	Frequent-----	Very brief to brief.	Dec-Jun	2.0-2.5	Apparent	Dec-Apr	>60	---	Moderate	Low.
20---------- Melvin	D	Frequent-----	Brief-----	Dec-Jun	0-1.0	Apparent	Dec-May	>60	---	High-----	Low.
21*: Moko----------	D	None---------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
Rock outcrop.											
22, 23, 24-------- Noark	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High.
25---------- Peridge	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
26, 27---------- Portia	C	None---------	---	---	>6.0	---	---	>60	---	High-----	High.
28*, 29*: Ramsey----------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Low------	Moderate.
Rock outcrop.											
30*: Secesh----------	B	Frequent-----	Brief-----	Dec-May	>6.0	---	---	>60	---	Low------	Moderate.
Elsah----------	B	Frequent-----	Brief-----	Dec-May	>6.0	---	---	>60	---	Low------	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
31--Sturkie	B	Occasional	Brief	Dec-Apr	>6.0	---	---	>60	---	Low	Low.
32--Sturkie	B	Frequent	Brief	Dec-Apr	>6.0	---	---	>60	---	Low	Low.
33--Wideman	A	Frequent	Very brief	Mar-May	>6.0	---	---	>60	---	Low	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL ANALYSES OF SELECTED SOILS

Soil and sample number	Depth	Horizon	Particle-size distribution (less than 2.0 mm)					
			Very coarse sand through medium sand (2.0-0.25 mm)	Fine sand (0.25-0.10 mm)	Very fine sand (0.10-0.05 mm)	Total sand (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
	Inches		Percent	Percent	Percent	Percent	Percent	Percent
Brockwell fine sandy loam: S76AR065-1(1-8)	0-6	Ap	23	44	5	72	25	3
	6-12	A2	35	28	4	67	27	6
	12-17	B1	33	28	4	65	28	7
	17-31	B21t	29	26	4	59	27	14
	31-41	B22t	26	35	4	65	21	14
	41-53	B23t	39	31	3	73	13	14
	53-63	B24t	40	24	2	66	6	28
	63-72	B24t	39	25	2	66	7	27
Gepp very cherty silt loam: S68AR025-2(1-5)	0-7	Ap	17	9	2	28	59	13
	7-12	B1	9	11	5	25	44	31
	12-40	B21t	1	1	1	3	22	75
	40-75	B22t	1	2	2	5	15	80
Moko very stony clay loam: S69AR025-3(1-2)	0-2	A11	11	6	7	24	41	34.7
	2-10	A12	10	6	6	22	43	34.6
Moko very stony silty clay loam: S72AR033-2(1-2)	0-2	A11	1	1	1	3	68	29
	2-10	A12	1	1	4	6	57	36.9
Moko very stony clay loam: S75AR049-1(1-2)	0-2	A11	14	7	10	31	39	30
	2-10	A12	10	6	11	27	39	34
Sturkie loam:[1] S69AR025-2(1-5)	0-6	Ap	12	24	10	46	43	11
	6-18	A12	4	11	8	23	57	20
	18-25	B1	2	6	6	14	64	22
	25-56	B21	1	2	4	7	67	26
	56-72	B22	1	2	4	7	66	27
Wideman fine sand: S77AR065-1(1-9)	1-6	A2	10	74	6	90	6	4
	6-11	C1	6	67	11	84	11	5
	11-32	C2	33	56	2	91	6	3
	32-38	C3	5	53	8	66	28	6
	38-48	C4	17	78	2	97	0	3
	48-52	C5	11	42	9	62	31	7
	52-63	C6	32	56	1	89	7	4
	63-72	C7	18	51	7	76	18	6
	72-80	C8	14	52	7	73	20	7

[1] Sturkie loam was included in the mapped areas of Sturkie silt loam, occasionally flooded.

TABLE 19.--CHEMICAL ANALYSES OF SELECTED SOILS

[Absence of an entry indicates analyses were not made]

Soil and sample name	Depth	Horizon	Extractable bases				Extractable acidity	Base saturation	Reaction (1:1 soil: water)	Organic matter	Available phosphorus
			Ca	Mg	Na	K					
	Inches		Meq/100g	Meq/100g	Meq/100g	Meq/100g	Meq/100g	Percent	pH	Percent	Parts per million
Brockwell fine sandy loam: S76AR065-1(1-8)	0-6	Ap	1.1	0.2	0.0	0.1	3.8	27	5.2	0.6	---
	6-12	A2	0.6	0.2	0.0	0.1	4.3	17	4.8	0.3	---
	12-17	B1	1.3	0.2	0.0	0.1	4.8	25	4.9	0.2	---
	17-31	B21t	3.2	1.1	0.0	0.2	6.5	41	5.1	0.3	---
	31-41	B22t	1.5	1.3	0.0	0.2	7.4	29	4.6	0.1	---
	41-53	B23t	1.5	1.2	0.0	0.2	5.8	33	4.9	0.1	---
	53-63	B24t	2.4	1.6	0.0	0.2	8.9	32	4.8	0.1	---
	63-72	B24t	2.4	1.4	0.0	0.2	8.9	31	4.7	0.1	---
Gepp very cherty silt loam: S68AR025-2(1-5)	0-7	Ap	5.8	1.1	0.2	0.2	3.0	74	6.6	3.0	10
	7-12	B1	1.3	0.8	0.1	0.3	4.0	49	5.7	1.3	9
	12-40	B21t	3.9	2.5	0.2	0.7	7.9	48	5.0	0.6	5
	40-75	B22t	2.9	2.0	0.2	0.6	8.9	39	5.0	0.4	3
Moko very stony clay loam: S69AR025-3(1-2)	0-2	A11	9.0	4.5	0.2	0.4	1.8	89	7.4	3.7	3
	2-10	A12	10.0	5.3	0.2	0.3	3.4	82	7.7	3.9	3
Moko very stony silty clay loam: S72AR033-2(1-2)	0-2	A11	11.6	2.3	0.2	0.7	6.5	69	8.0	4.1	13
	2-10	A12	10.8	2.4	0.1	0.6	4.4	76	8.1	3.9	6
Moko very stony clay loam: S75AR049-1(1-2)	0-2	A11	19.9	8.5	0.1	0.5	7.2	80	7.2	5.4	---
	2-10	A12	19.5	10.4	0.0	0.4	7.0	81	7.3	5.4	---
Sturkie loam:[1] S69AR025-2(1-5)	0-6	Ap	8.0	1.7	0.2	0.2	2.0	83	7.2	2.6	7
	6-18	A12	8.1	2.2	0.2	0.2	2.2	83	7.0	1.8	4
	18-25	B1	7.6	1.7	0.2	0.1	3.0	76	7.1	1.5	3
	25-56	B21	11.2	2.1	0.2	0.2	3.7	79	7.0	1.6	4
	56-72	B22	9.9	2.1	0.2	0.2	4.9	72	7.1	1.0	9
Wideman fine sand: S77AR065-1(1-9)	1-6	A2	0.7	0.1	0.0	0.1	2.6	26	4.0	0.5	---
	6-11	C1	1.4	0.1	0.0	0.1	2.0	44	5.2	0.5	---
	11-32	C2	0.4	0.0	0.0	0.0	0.3	57	5.7	0.1	---
	32-38	C3	3.6	0.4	0.0	0.1	7.0	37	5.4	1.0	---
	38-48	C4	0.5	0.1	0.0	0.0	1.7	26	6.2	0.1	---
	48-52	C5	2.9	0.4	0.0	0.0	5.3	38	5.6	0.7	---
	52-63	C6	0.5	0.1	0.0	0.0	1.8	25	5.7	0.1	---
	63-72	C7	1.7	0.4	0.0	0.0	3.3	39	5.4	0.7	---
	72-80	C8	1.0	0.3	0.0	0.1	2.6	35	5.4	0.2	---

[1] Sturkie loam was included in the mapped areas of Sturkie silt loam, occasionally flooded.

TABLE 20.--ENGINEERING TEST DATA

[Tests performed by Arkansas State Highway Department, in cooperation with Federal Highway Administration, Department of Transportation, in accordance with standard procedures of the American Association of State Highway and Transportation Officials (AASHTO) (1)]

Soil name and location	Arkansas State Highway Dept. Lab. No.	Depth from surface	Moisture-density data[1]		Percentage passing sieve--[2]			Liquid limit	Plasticity index	Classification	
			Maximum dry density	Optimum moisture	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			AASHTO[3]	Unified[4]
		In	Lbs/cu ft	Pct				Pct			
Gassville very cherty silt loam:	S72AR033-1										
SW1/4NE1/4NW1/4 sec. 29,	(2)	2-9	119	12	38	34	31	24	4	A-2-4(0)	GM-GC
T. 18 N., R. 7 W.	(3)	9-22	83	31	100	99	98	69	30	A-7-5(38)	MH
Wideman fine sand:	S78AR065-1										
NW1/4SE1/4SE1/4 sec. 20,	(3)	11-32	103	13	100	98	6	--	NP	A-3(0)	SP-SM
T. 17 N., R. 9 W.	(4)	32-38	116	11	100	99	35	--	NP	A-2-4(0)	SM

[1]Based on AASHTO Designation: T 99-57, Method A (1).

[2]Mechanical analysis according to AASHTO Designation T 88-57 (1). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-sized fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[3]Based on AASHTO Designation M 145-66 (1).

[4]Based on ASTM Designation D 2487-66T.

TABLE 21.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Agnos	Clayey, mixed, mesic Typic Hapludults
Arkana	Very-fine, mixed, mesic Mollic Hapludalfs
Boden	Clayey, mixed, mesic Typic Hapludults
Brockwell	Coarse-loamy, siliceous, mesic Typic Paleudults
Captina	Fine-silty, mixed, mesic Typic Fragiudults
Doniphan	Clayey, mixed, mesic Typic Paleudults
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Estate	Fine, mixed, mesic Typic Hapludalfs
Gassville	Clayey, mixed, mesic Typic Hapludults
Gepp	Very-fine, mixed, mesic Typic Paleudalfs
Hontas	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Noark	Clayey-skeletal, mixed, mesic Typic Paleudults
Peridge	Fine-silty, mixed, mesic Typic Paleudalfs
Portia	Fine-loamy, siliceous, mesic Typic Paleudalfs
Ramsey	Loamy, siliceous, mesic Lithic Dystrochrepts
Secesh	Fine-loamy, siliceous, mesic Ultic Hapludalfs
Sturkie	Fine-silty, mixed, mesic Cumulic Hapludolls
Wideman	Sandy, siliceous, mesic Typic Udifluvents

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OZARK COUNTY | HOWELL | M I S S O U R I | OREGON | COUNTY

92°00′ 91°50′ 91°40′ 91°30′

Mammoth Springs

T 21 N

T 20 N

T 19 N

— 36°20′

COUNTY

BAXTER COUNTY

SHARP COUNTY

IZARD COUNTY

R 11 W R 10 W R 9 W R 8 W R 7 W R 6 W R 5 W

Viola

SALEM

Bexar

Glencoe

Norfork Lake

Little Creek

Bennett Cr

Exley Branch

Hay Creek

Trace Creek

Pine Creek

Water Fork Br

Russell Br

Sycamore Creek

Shipman Cr

Pond Hill Creek

Horton Branch

Cherry Hollow Br

Mill Pond Branch

Spring Fork

Pond Creek

Town Creek

Greasy Creek

Cochran Branch

Wild Horse Creek

Little Creek

Gist Cr

E BRANCH

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

1 AGNOS-GASSVILLE: Deep to moderately deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of siltstone and dolomite; on uplands

2 ARKANA-MOKO: Moderately deep and shallow, gently sloping to steep, well drained, very cherty and very stony soils that formed in residuum of dolomite and limestone; on uplands

3 GASSVILLE-DONIPHAN: Moderately deep to deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of siltstone and dolomite; on uplands

4 GEPP-GASSVILLE: Deep to moderately deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of dolomite and of siltstone and dolomite; on uplands

5 BROCKWELL: Deep, gently sloping to moderately steep, well drained, loamy soils that formed in residuum of sandstone; on uplands

6 STURKIE-PERIDGE-SECESH: Deep, level to gently sloping, well drained, loamy soils that formed in alluvium; on flood plains and terraces

7 HONTAS-PERIDGE: Deep, level to gently sloping, moderately well drained and well drained, loamy soils that formed in alluvium; on flood plains and terraces

Compiled 1981

N

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ARKANSAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
FULTON COUNTY, ARKANSAS

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

GENERAL SOIL MAP
IZARD COUNTY, ARKANSAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ARKANSAS AGRICULTURAL EXPERIMENT STATION

LEGEND

1 AGNOS-GASSVILLE: Deep to moderately deep, gently sloping to moderately steep, well drained, very cherty soils that formed in residuum of siltstone and dolomite; on uplands

2 ARKANA-MOKO: Moderately deep and shallow, gently sloping to steep, well drained, very cherty and very stony soils that formed in residuum of dolomite and limestone; on uplands

3 BROCKWELL-PORTIA-BODEN: Deep, gently sloping to moderately steep, well drained, loamy soils that formed in residuum of sandstone, residuum or colluvium that derived from interbedded sandstone and limestone, and residuum of sandstone and siltstone; on uplands

4 ESTATE-PORTIA-MOKO: Deep and shallow, gently sloping to steep, well drained, stony and loamy soils that formed in residuum or colluvium of interbedded sandstone and limestone and residuum of limestone or dolomite; on uplands

5 NOARK-ARKANA-MOKO: Deep, moderately deep and shallow, gently sloping to steep, well drained, very cherty and very stony soils that formed in residuum of cherty limestone; on uplands

6 STURKIE-PERIDGE: Deep, nearly level to gently sloping, well drained, loamy soils that formed in alluvium; on flood plains and terraces

7 HONTAS-PERIDGE-WIDEMAN: Deep, level to gently sloping, moderately well drained, well drained, and excessively drained, loamy and sandy soils that formed in alluvium; on flood plains, terraces, and natural levees

Compiled 1981

Scale 1:190,080

1 0 1 2 3 Miles

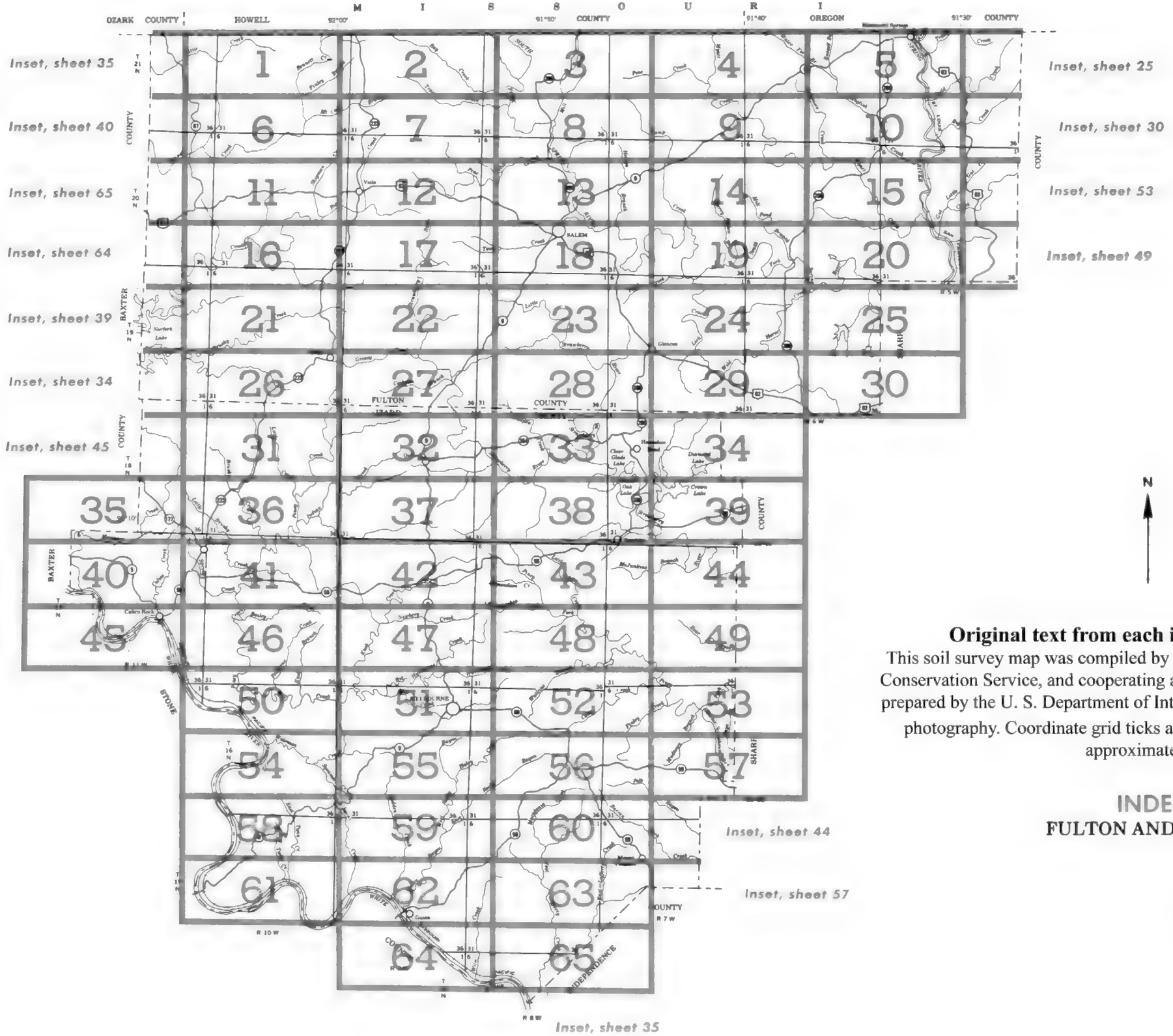
1 0 3 6 Km

N

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1	
7	8	9	10	11	12	
18	17	16	15	14	13	
19	20	21	22	23	24	
30	29	28	27	26	25	
31	32	33	34	35	36	

Original text from each individual map sheet read:

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

INDEX TO MAP SHEETS

FULTON AND IZARD COUNTIES, ARKANSAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

SOIL LEGEND

The legend is numeric. Soil names followed by the superscript 1/ are broadly defined units. The composition of these units is more variable than that of other units in the survey area, but is controlled well enough to be interpreted for the expected use of the soils. Soils without a slope designation in the name are those that are found only on nearly level landscapes of frequently flooded bottom lands

SYMBOL	NAME
1	Agnos very cherty silt loam, 3 to 8 percent slopes
2	Agnos very cherty silt loam, 8 to 20 percent slopes
3	Arkana-Moko complex, 3 to 8 percent slopes
4	Arkana-Moko complex, 8 to 20 percent slopes
5	Arkana-Moko complex, 20 to 40 percent slopes
6	Boden gravelly sandy loam, 3 to 8 percent slopes
7	Boden gravelly sandy loam, 8 to 20 percent slopes
8	Brockwell fine sandy loam, 3 to 8 percent slopes
9	Brockwell fine sandy loam, 8 to 12 percent slopes, eroded
10	Brockwell gravelly sandy loam, 3 to 8 percent slopes
11	Brockwell gravelly sandy loam, 8 to 20 percent slopes
12	Captina silt loam, 3 to 8 percent slopes
13	Estate-Portia-Moko association, rolling 1/
14	Estate-Portia-Moko association, steep 1/
15	Gassville very cherty silt loam, 8 to 20 percent slopes
16	Gassville-Doniphan complex, 3 to 8 percent slopes
17	Gepp very cherty silt loam, 3 to 8 percent slopes
18	Gepp very cherty silt loam, 8 to 20 percent slopes
19	Hontas silt loam, frequently flooded
20	Melvin silt loam, frequently flooded
21	Moko-Rock outcrop complex, 20 to 50 percent slopes
22	Noark very cherty silt loam, 3 to 8 percent slopes
23	Noark very cherty silt loam, 8 to 20 percent slopes
24	Noark very cherty silt loam, 20 to 40 percent slopes
25	Pendge silt loam, 3 to 8 percent slopes,
■	Portia sandy loam, 3 to 8 percent slopes, eroded
27	Portia sandy loam, 8 to 12 percent slopes, eroded
28	Ramsey-Rock outcrop complex, 3 to 15 percent slopes
29	Ramsey-Rock outcrop complex, 15 to 40 percent slopes
30	Secesh and Elsah soils, frequently flooded 1/
31	Sturkie silt loam, occasionally flooded
32	Sturkie silt loam, frequently flooded
33	Wideman fine sand, frequently flooded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label) (Haden Airstrip)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (Pond, Pond, Levee)
- STATE COORDINATE TICK
- LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (71)
- Federal (178)
- State (28)
- County, farm or ranch (1288)

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water, W)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water, W)
- Intermittent (int, I)

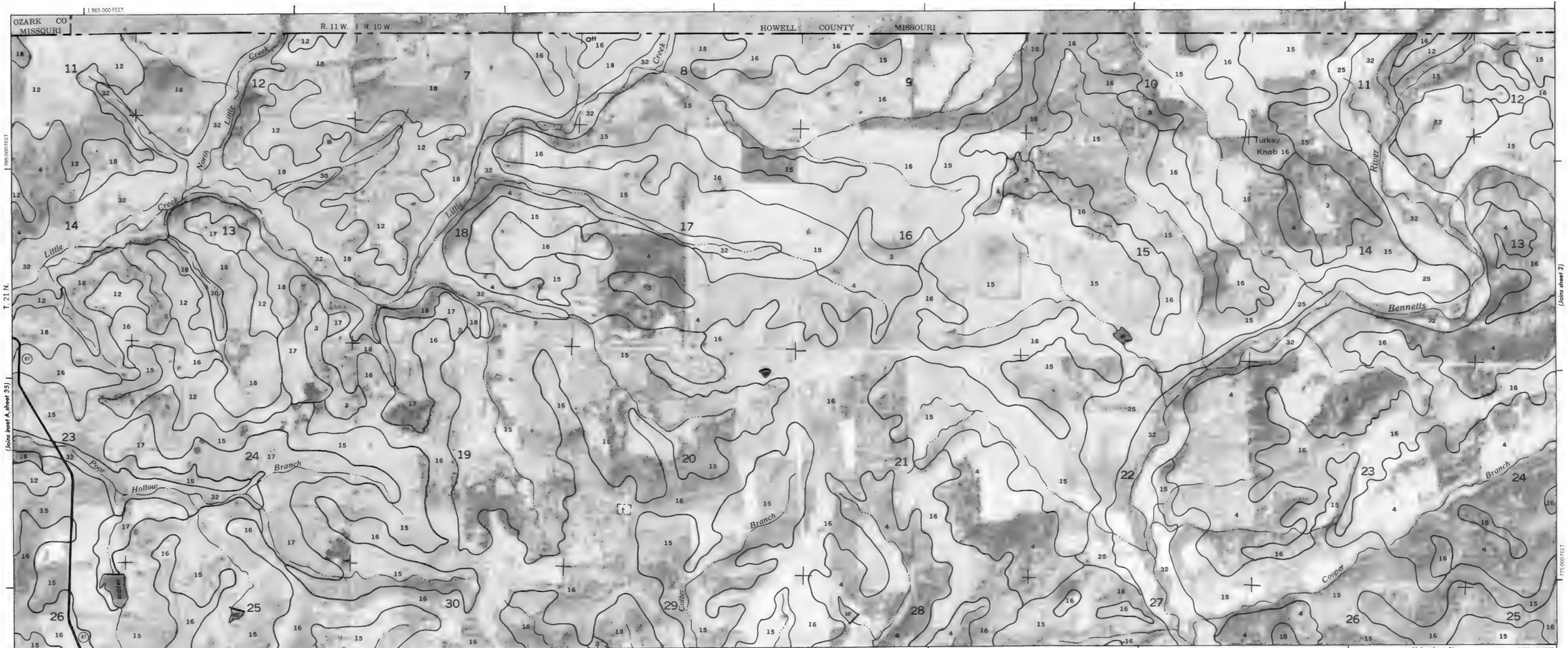
MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

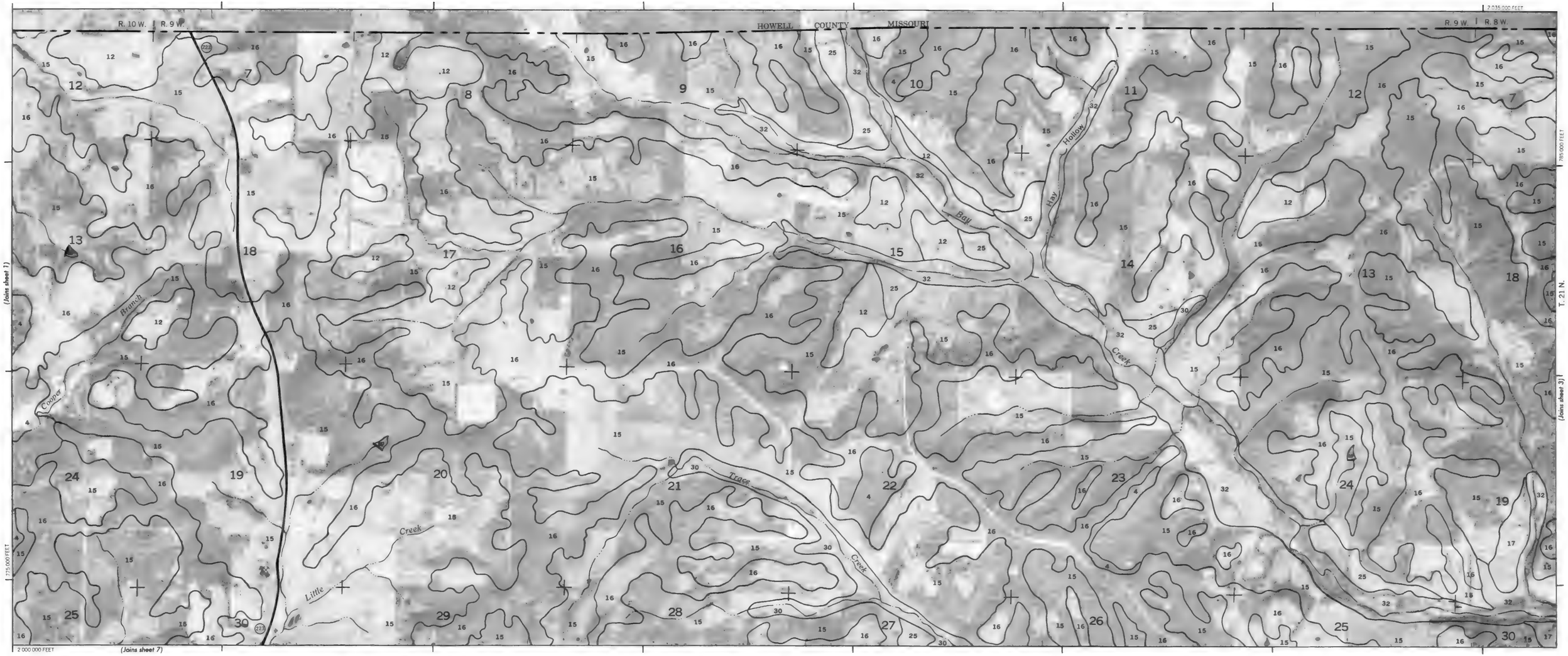
SPECIAL SYMBOLS FOR SOIL SURVEY

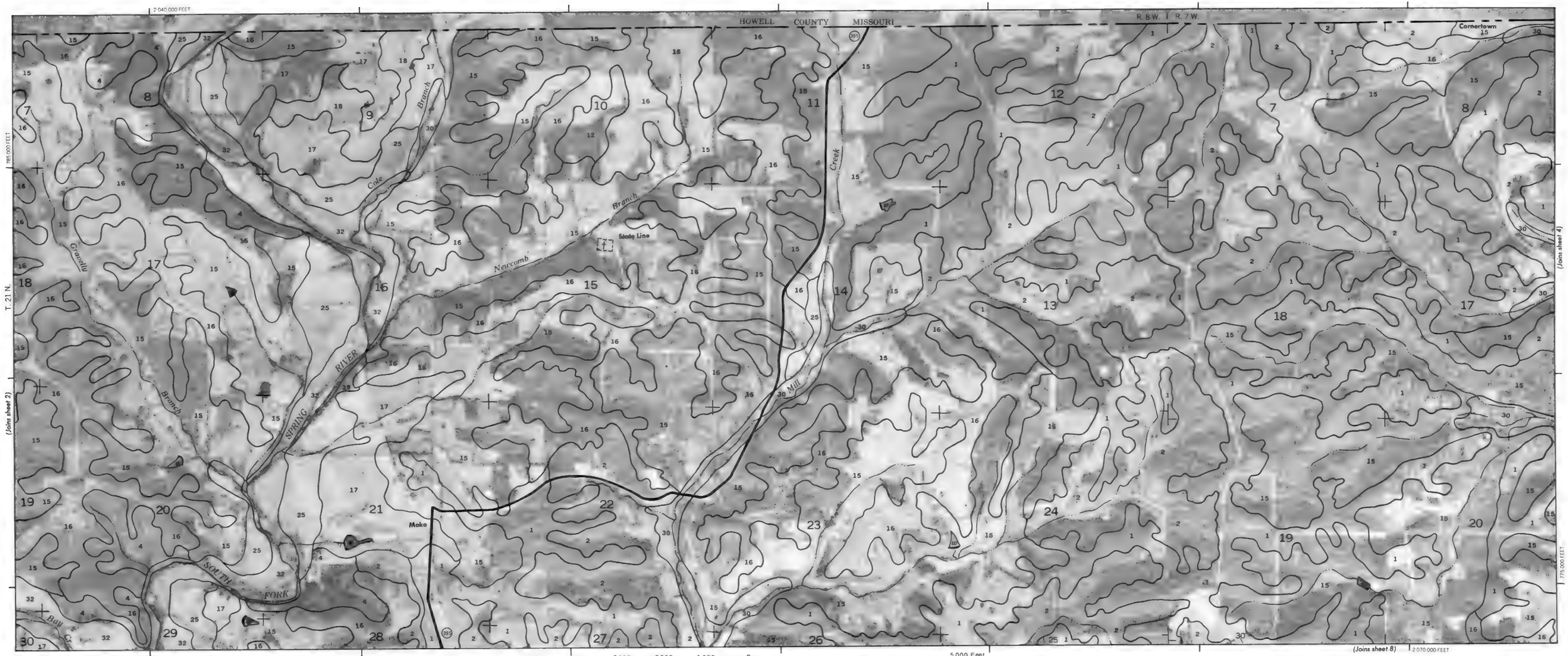
- SOIL DELINEATIONS AND SYMBOLS (CnB, WaC2)
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 1

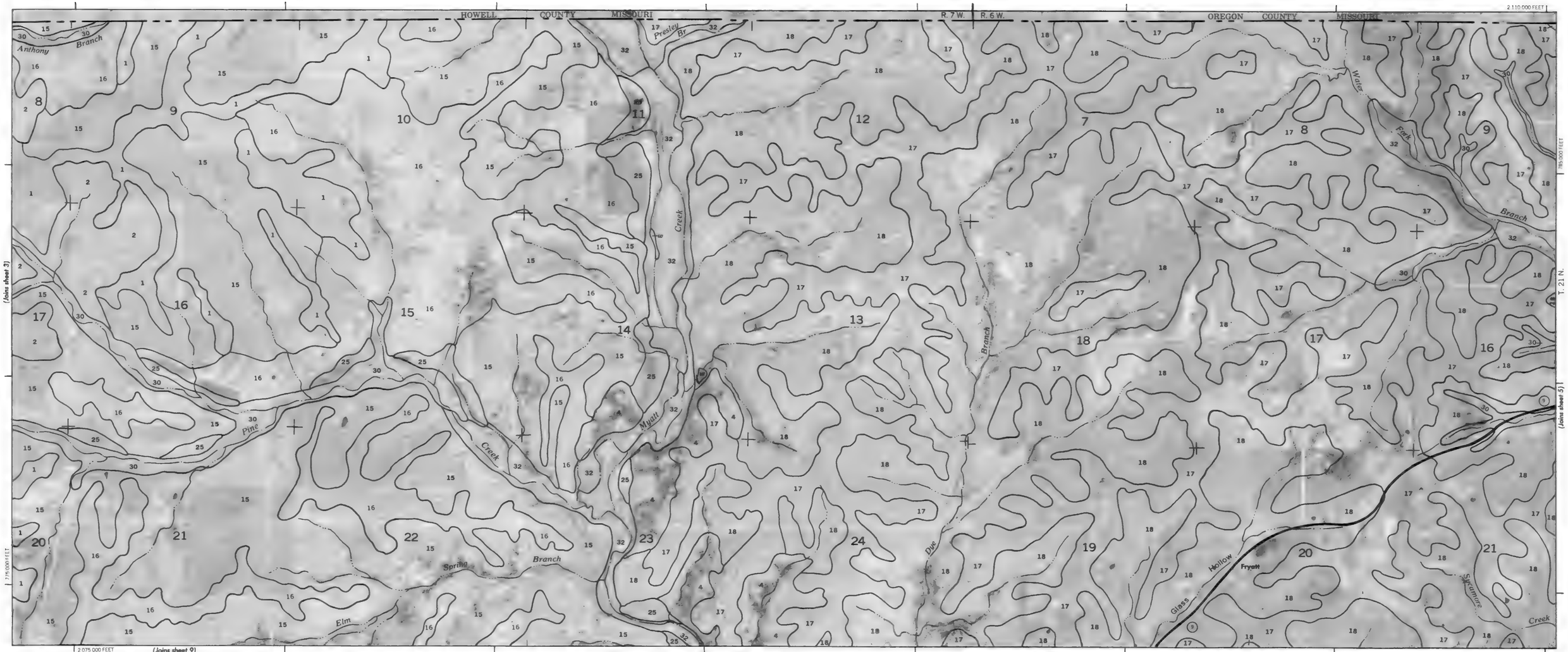


FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 2

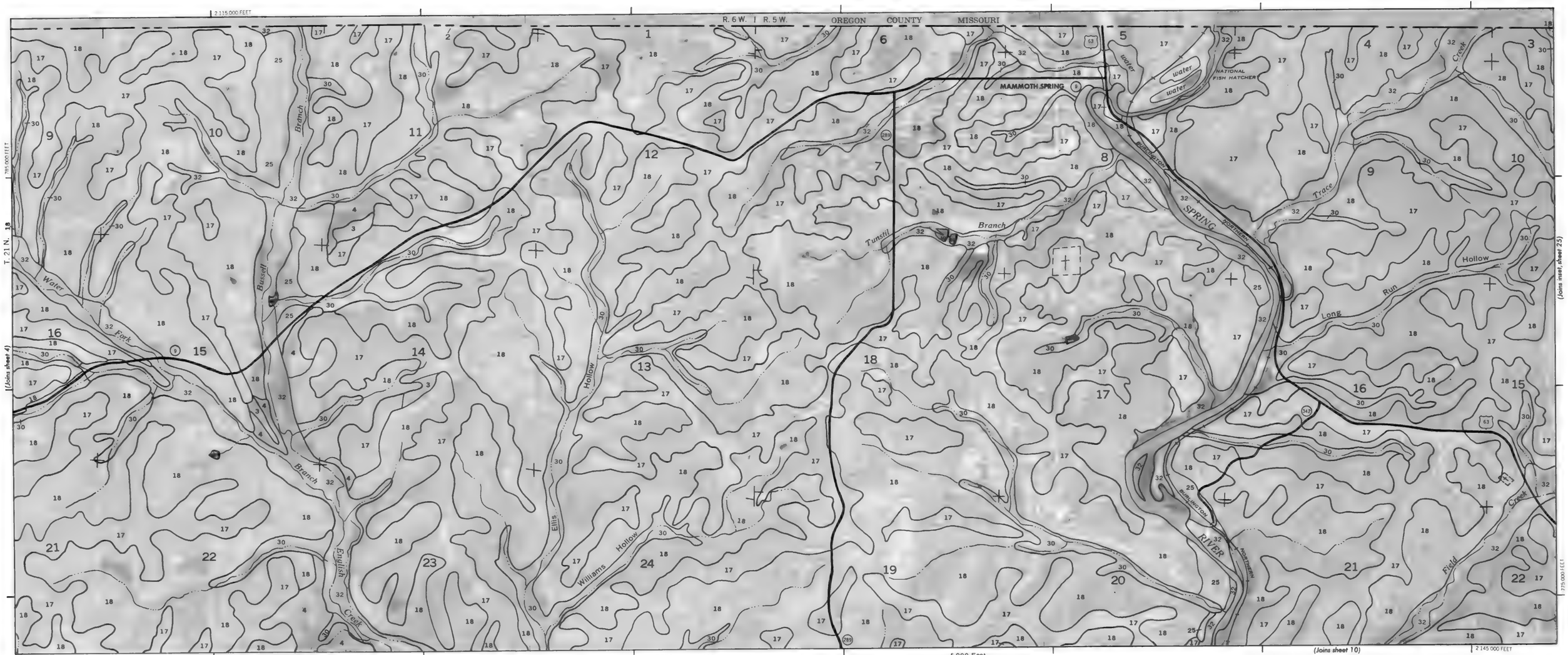



2 040 000 FEET
HOWELL COUNTY MISSOURI
R. 8 W.
R. 7 W.
Cornertown
785 000 FEET
T. 21 N.
Coke Branch
Gravelly Branch
Newcomb Branch
Sticky Line
Mill Creek
SPRING RIVER
SOUTH FORK
Bay Cr.
Moko
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 8)
2 070 000 FEET
775 000 FEET
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 4



FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 5



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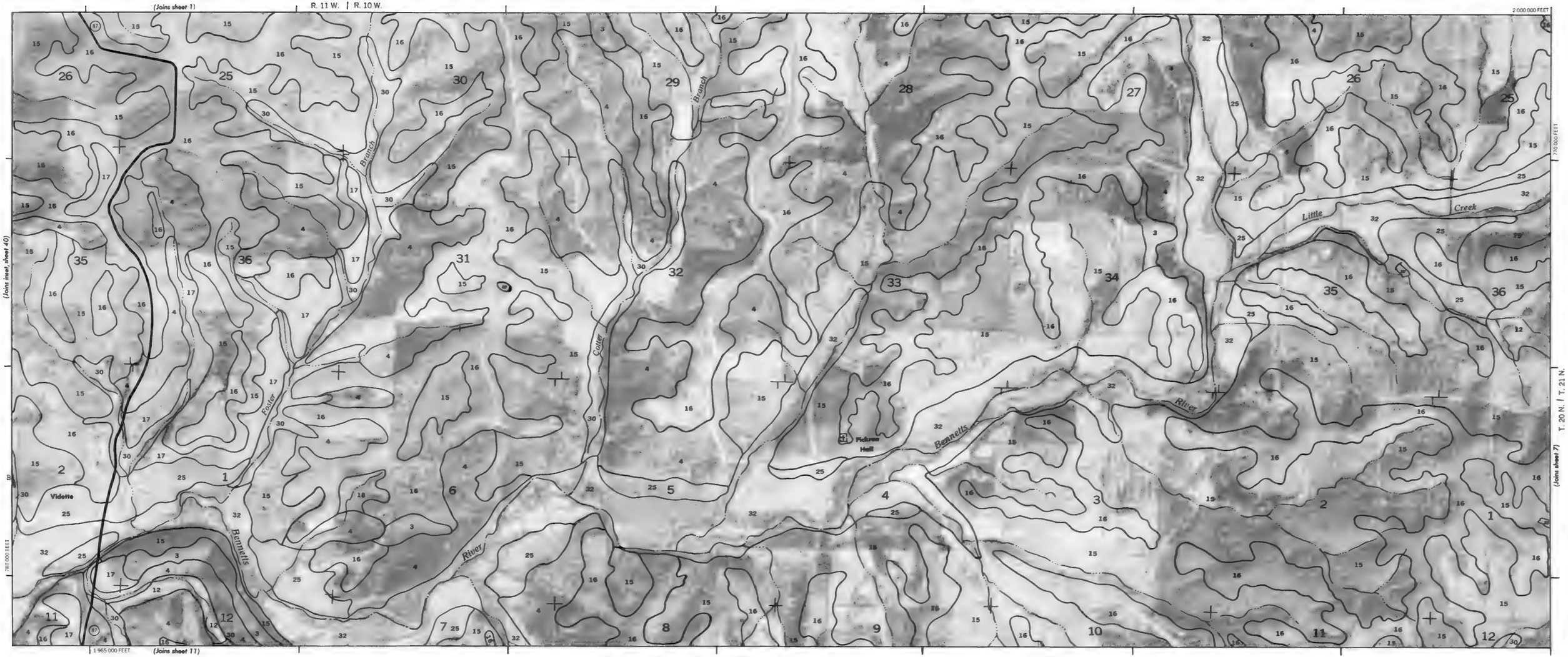
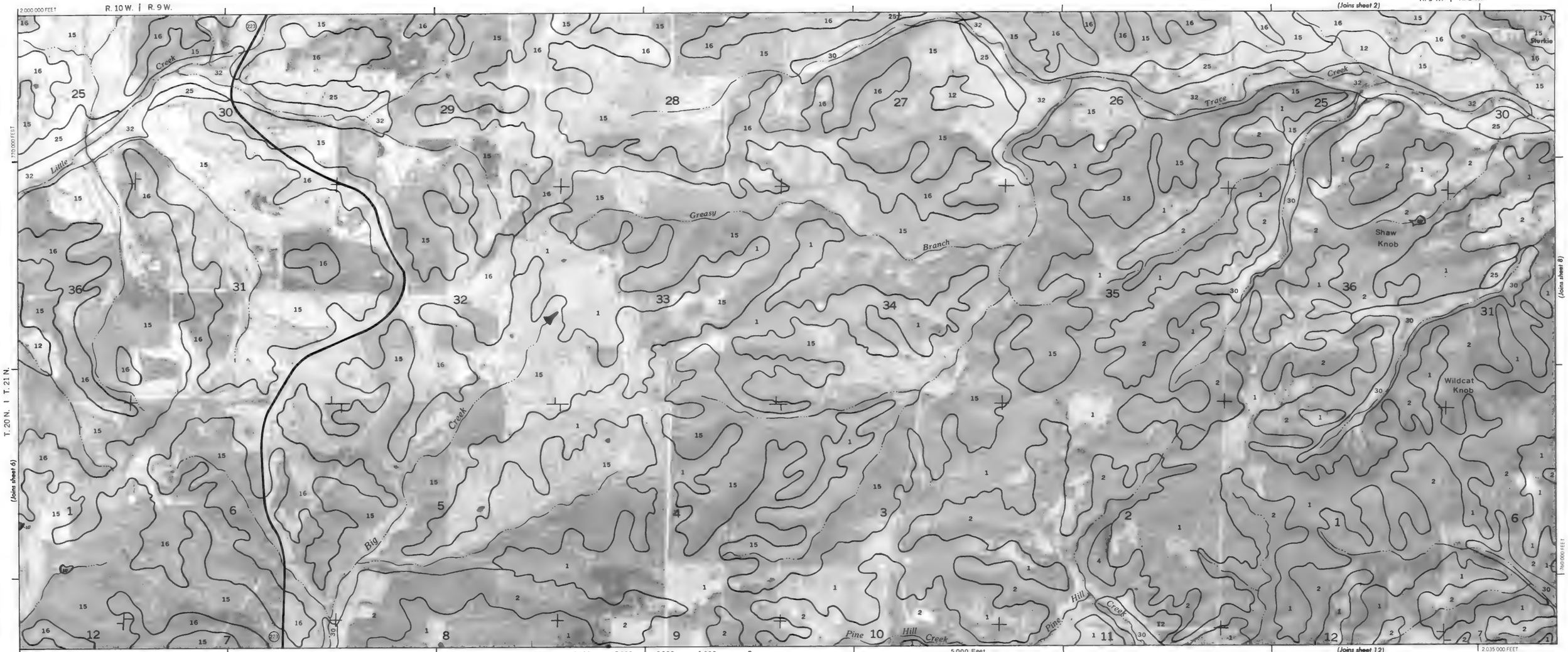
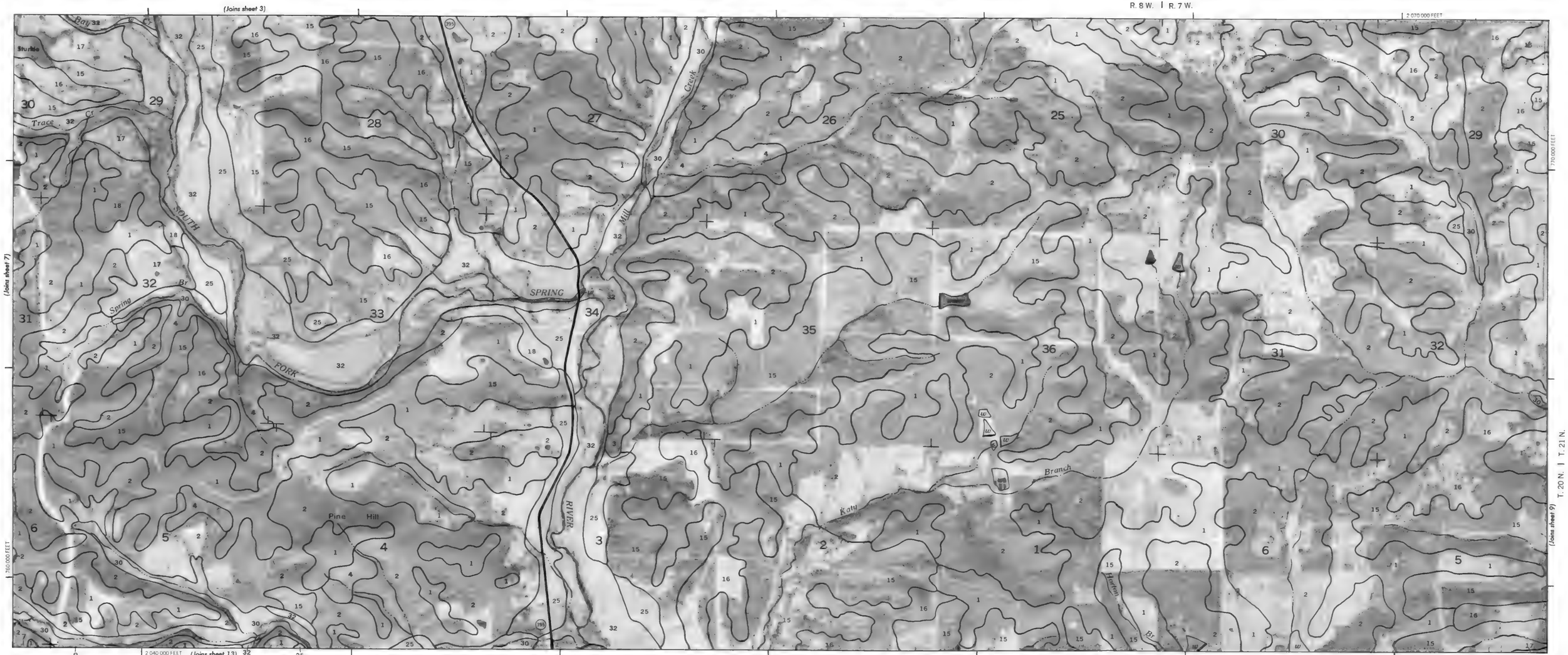
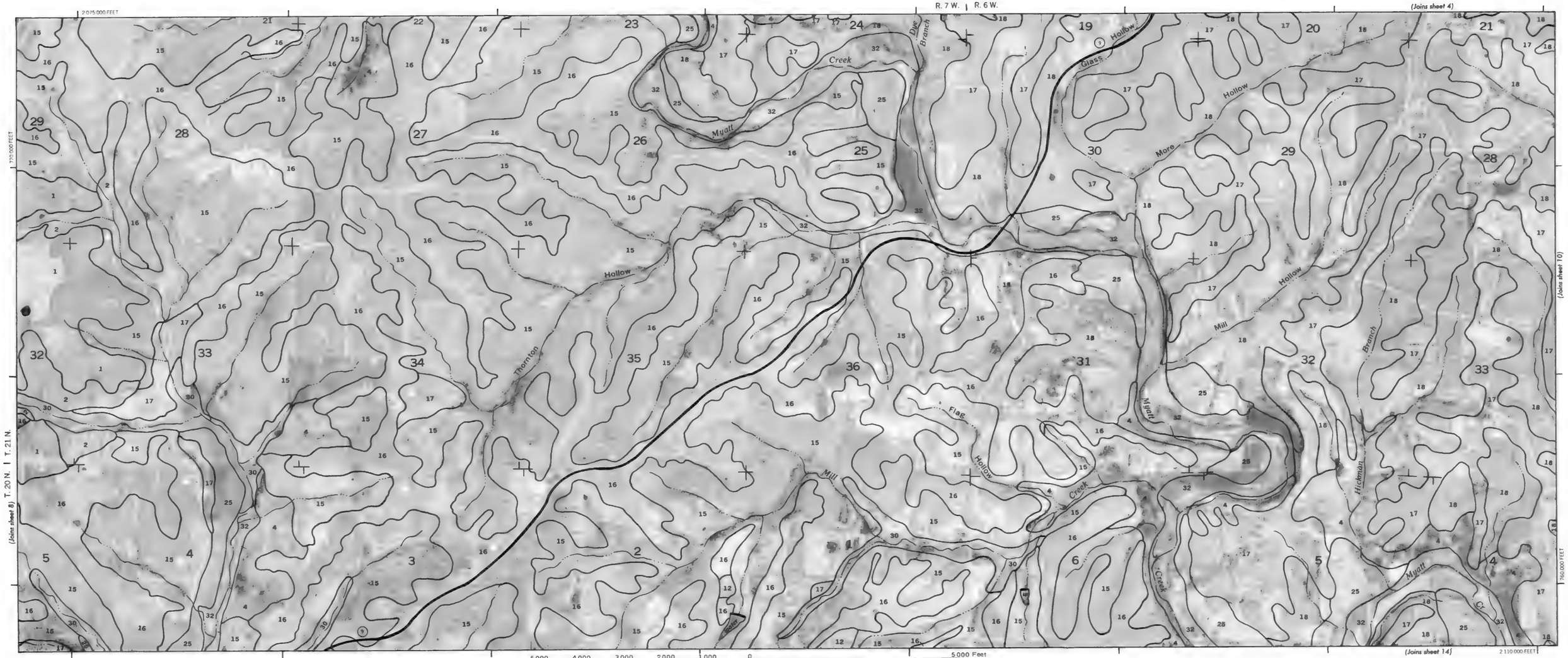
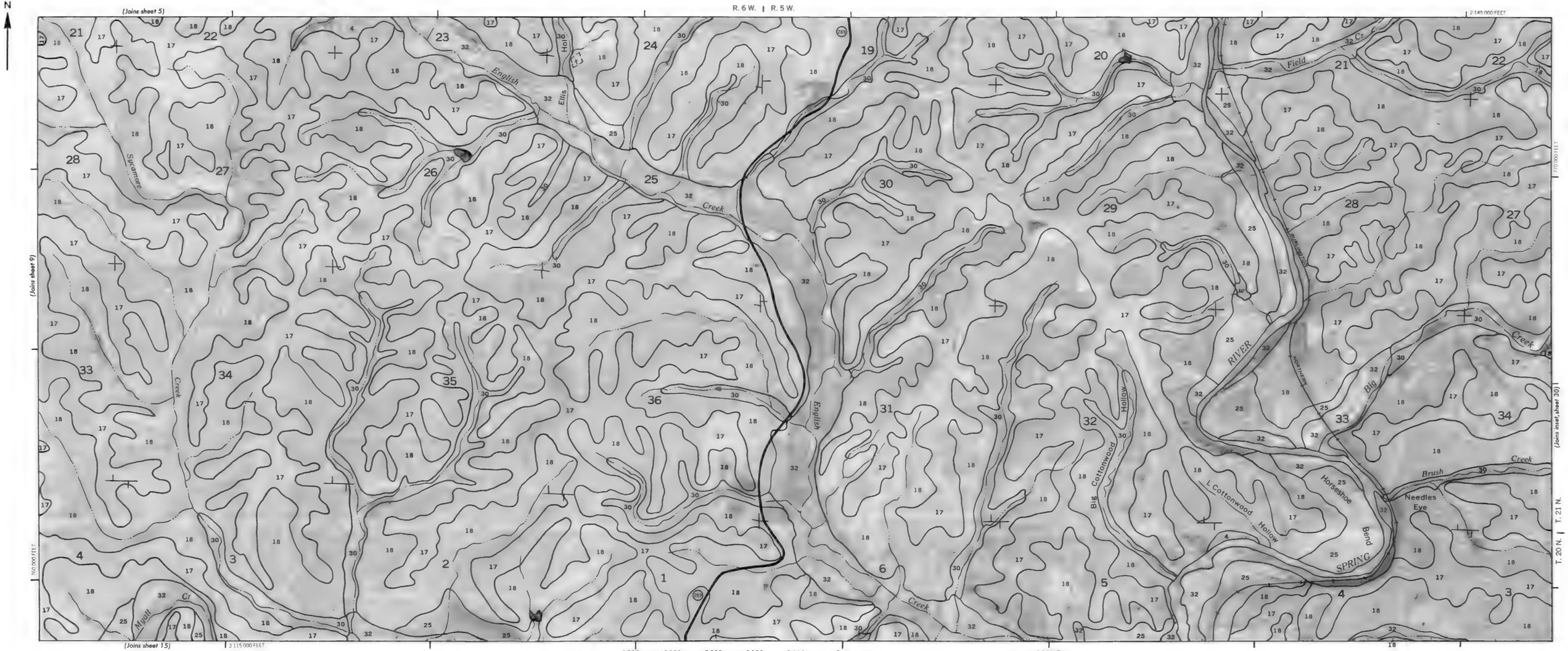



2 000 000 FEET
R. 10 W. | R. 9 W.
R. 9 W. | R. 8 W.
(Joins sheet 2)
170 000 FEET
T. 20 N. | T. 21 N.
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 12)
2 035 000 FEET
Little Creek
Greasy Branch
Big Creek
Trace Creek
Pine Hill Creek
Shaw Knob
Wildcat Knob
Sturkie
5000 4000 3000 2000 1000 0 5000 Feet
0 1 Kilometer
Scale - 1:20000

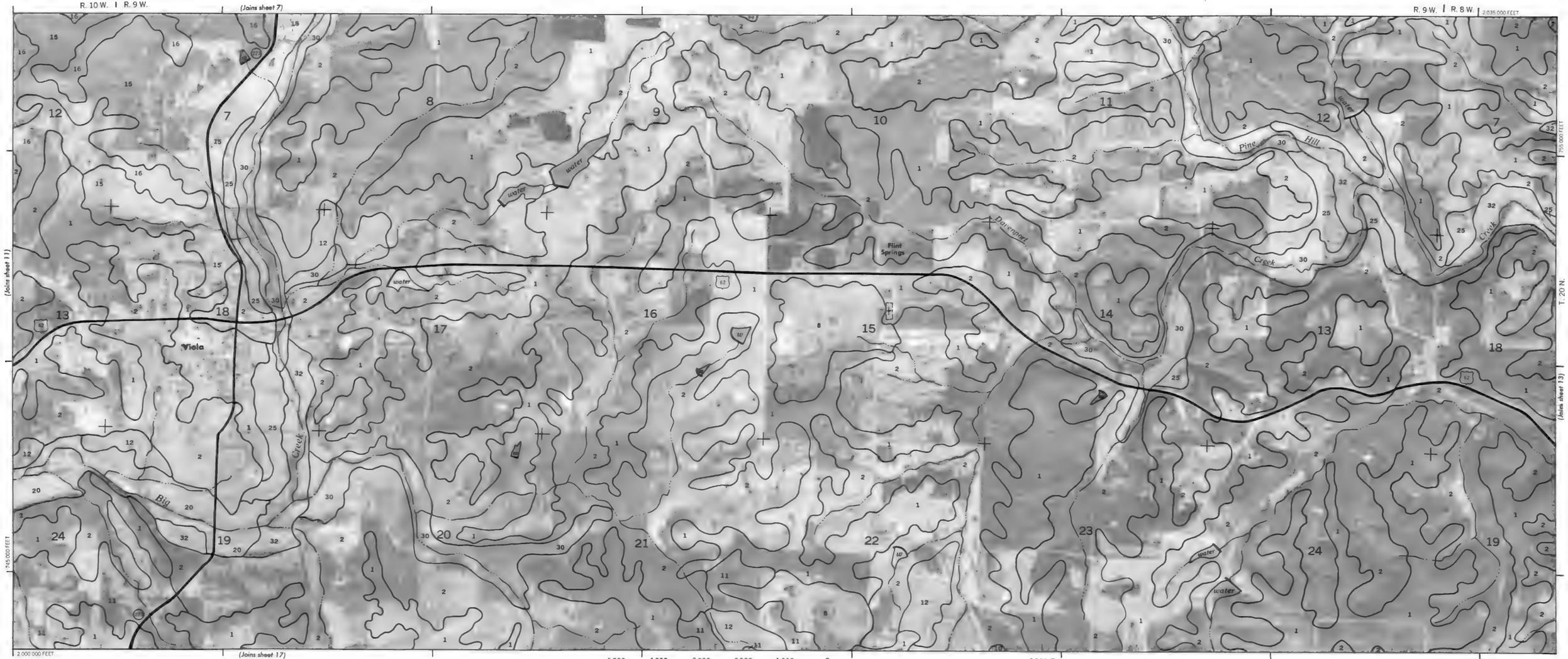

N
(Joins sheet 3)
R. 8 W. | R. 7 W.
2 070 000 FEET
760 000 FEET
770 000 FEET
(Joins sheet 7)
(Joins sheet 9)
T. 20 N. | T. 21 N.
2 040 000 FEET
(Joins sheet 13)
Bay
Sturkie
Trace Cr.
SOUTH FORK
Spring Br.
SPRING
Mill Creek
RIVER
Pine Hill
Katy Branch
Harris Br.
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 9

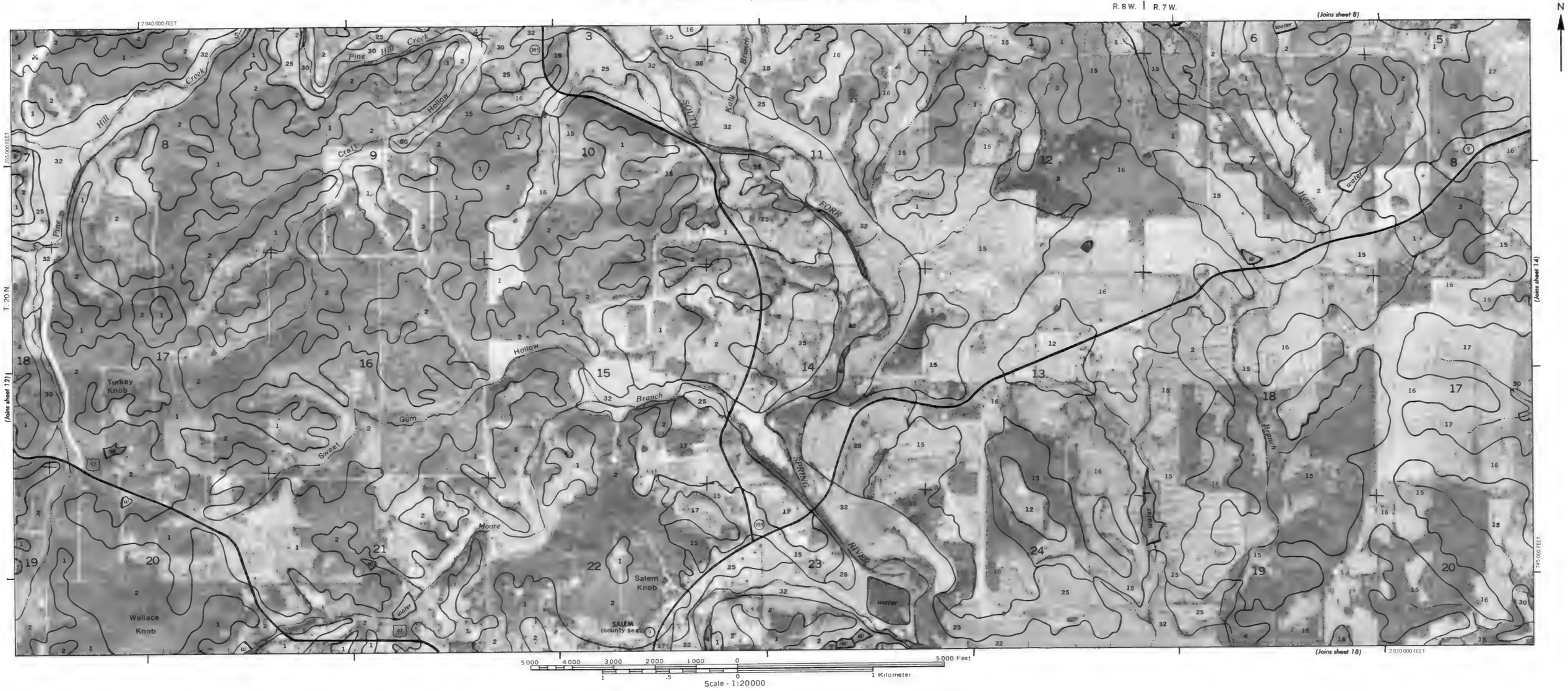


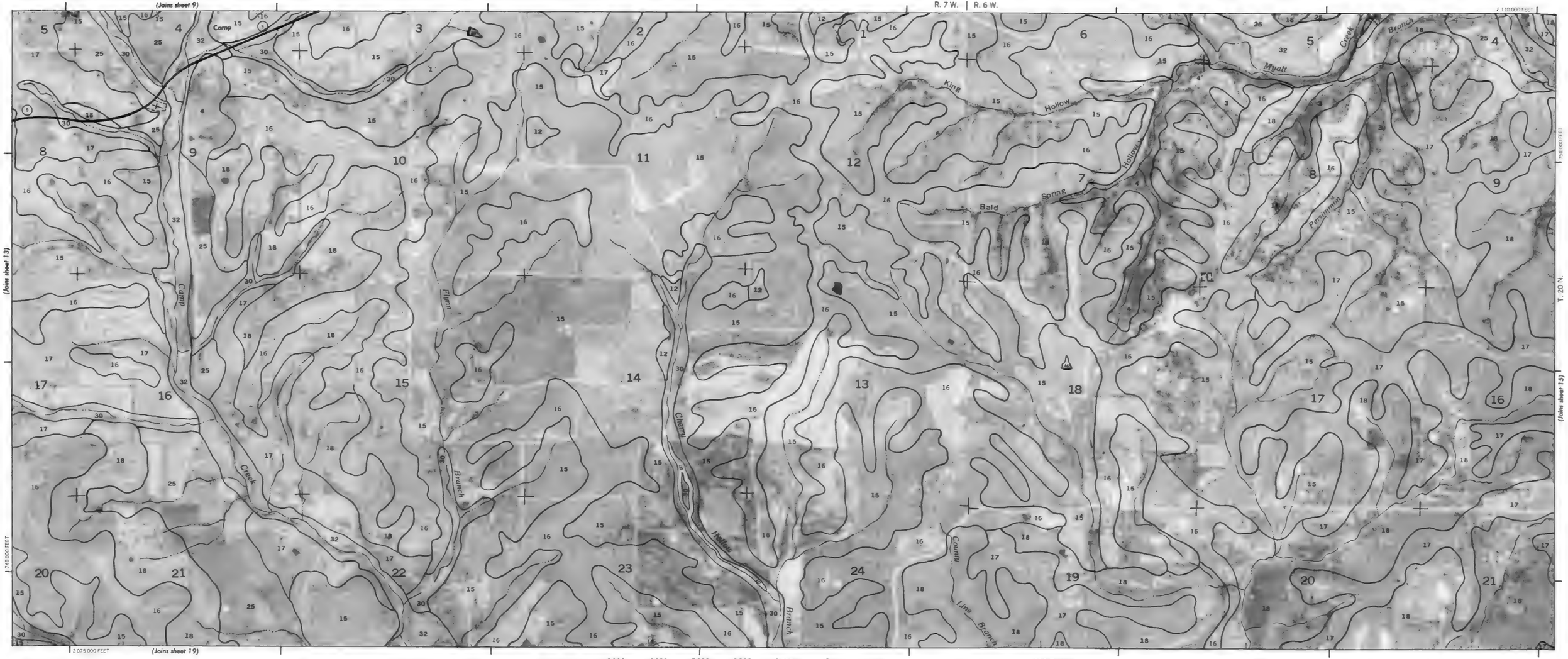

N
(Joins sheet 5)
R. 6 W. | R. 5 W.
2 145 000 FEET
(Joins sheet 9)
765 000 FEET
770 000 FEET
(Joins inset, sheet 30)
T. 20 N. | T. 21 N.
(Joins sheet 15)
2 115 000 FEET
English
Ellis
Creek
Sycamore
Creek
Mudd
Cr
Field
Ct
RIVER
NORTHERN
Big
Creek
Brush
Creek
Big Cottonwood
Hollow
L Cottonwood
Hollow
Horseshoe
Bend
SPRING
Needles
Eye
English
Creek
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 11


N
R. 10 W.
R. 9 W.
R. 9 W.
R. 8 W.
2,035,000 FEET
(Joins sheet 7)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 17)
T. 20 N.
755,000 FEET
745,000 FEET
2,000,000 FEET
Viola
Flint Springs
Davenport
Pine Hill
Big Creek
Creek
water
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 13




N
(Joins sheet 9)
R. 7 W.
R. 6 W.
2 110 000 FEET
(Joins sheet 13)
T. 20 N.
(Joins sheet 15)
2 075 000 FEET
(Joins sheet 19)
Camp
Camp Creek
Flynn
Cherry
Cherry Branch
Hollow
Branch
King
Hollow
Myatt
Creek
Branch
Hollow
Spring
Bald
Pessimmon
County
Line
Branch
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 15

15

N

R. 6 W. | R. 5 W.

2 115 000 FEET

(Joins sheet 10)

T. 20 N.

(Joins sheet 14)

(Joins inset, sheet 53)

Myatt Creek

Hatfield Hollow

Spring Hollow

Blue Spring

Wolf Creek

English Creek

King

SPRING RIVER

NORTHERN PUBLISHER CO.

Many Islands water

Little Gut

Gut Creek

Myatt Creek

745 000 FEET

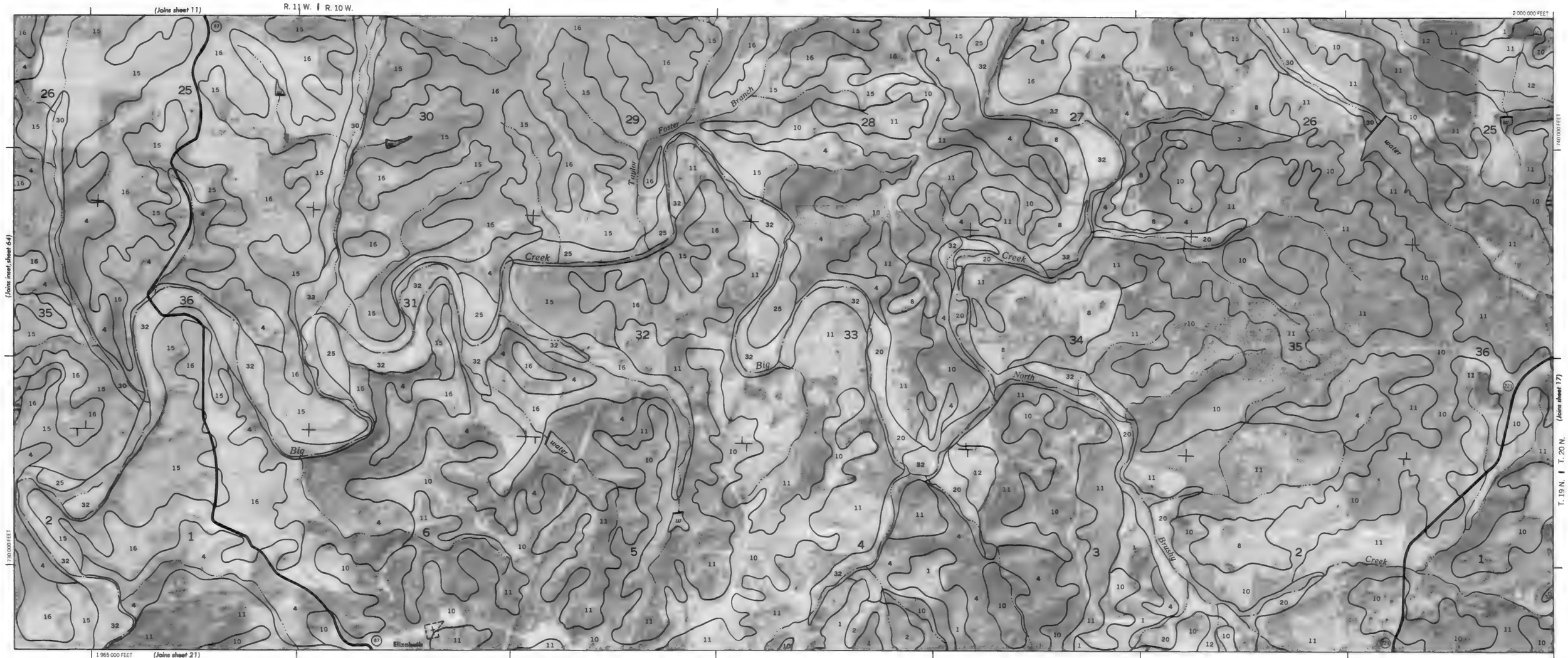
(Joins sheet 20)

2 145 000 FEET

5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

Scale - 1:20000


N
(Joins sheet 11)
R. 11 W.
R. 10 W.
2 000 000 FEET
740 000 FEET
730 000 FEET
1 965 000 FEET
(Joins inset, sheet 64)
(Joins sheet 17)
(Joins sheet 21)
T. 19 N.
T. 20 N.
Foster
Branch
Taylor
Creek
Big
water
North
Brushy
Creek
Elizabeth
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 17

17

N

2 000 000 FEET

R. 10 W. | R. 9 W.

(Joins sheet 12) R. 9 W. | R. 8 W.

240 000 FEET

730 000 FEET

(Joins sheet 16)

(Joins sheet 18)

T. 19 N. | T. 20 N.

Shady Grove

Brau Branch

Strawberry River

water

Town Branch

(Joins sheet 22)

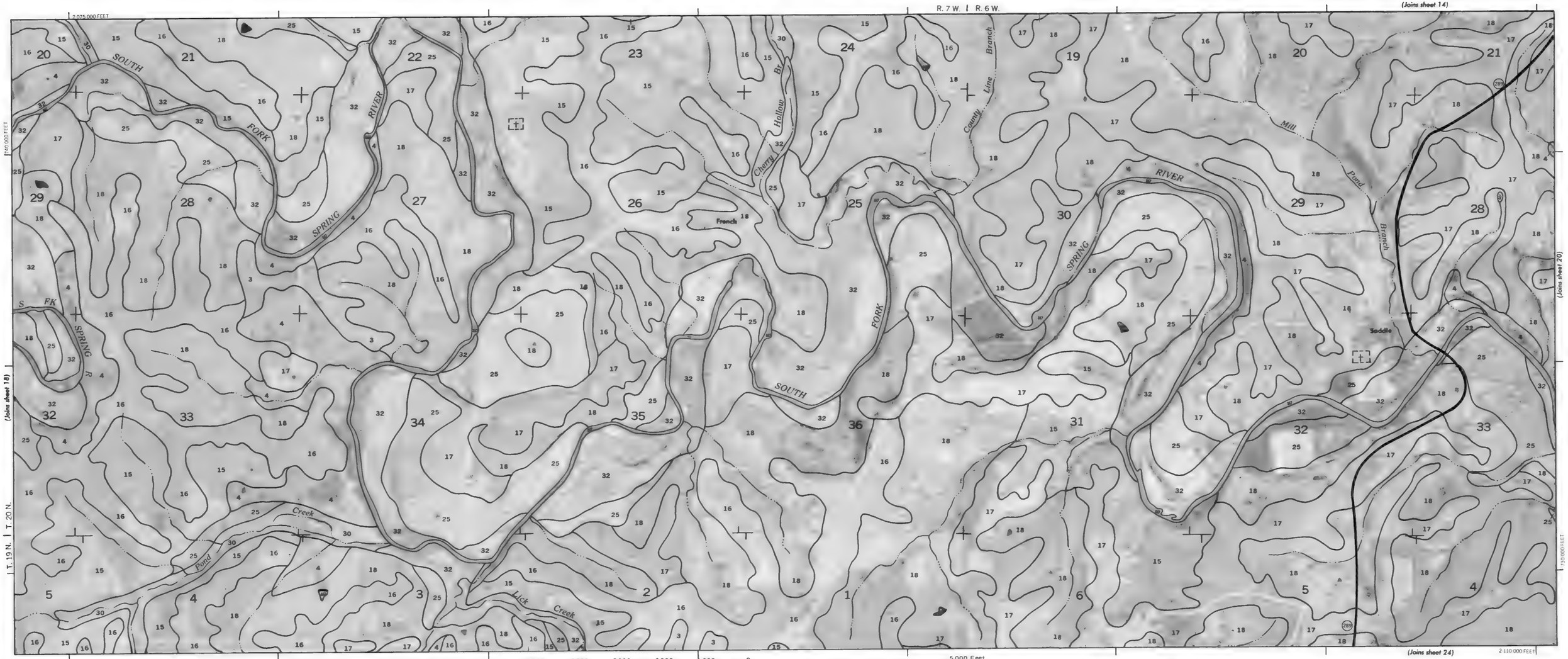
2 035 000 FEET

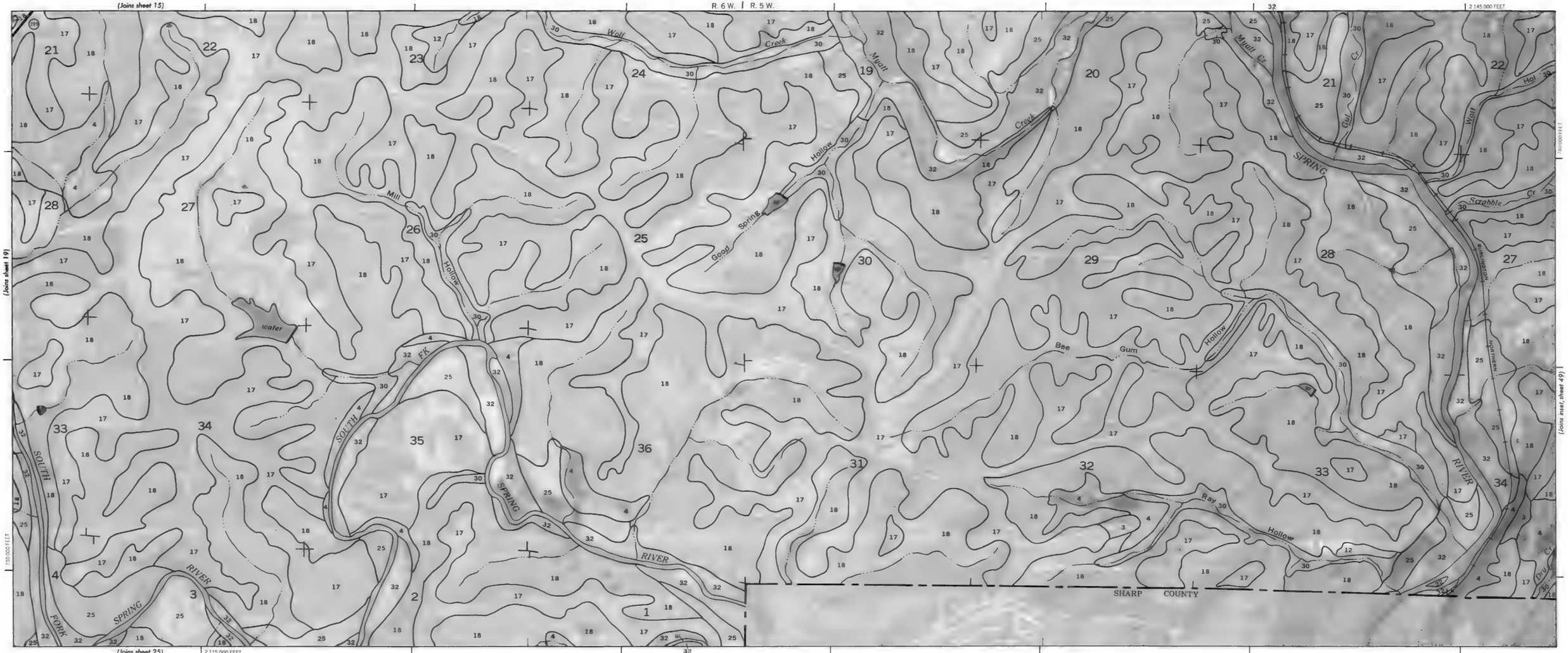
5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

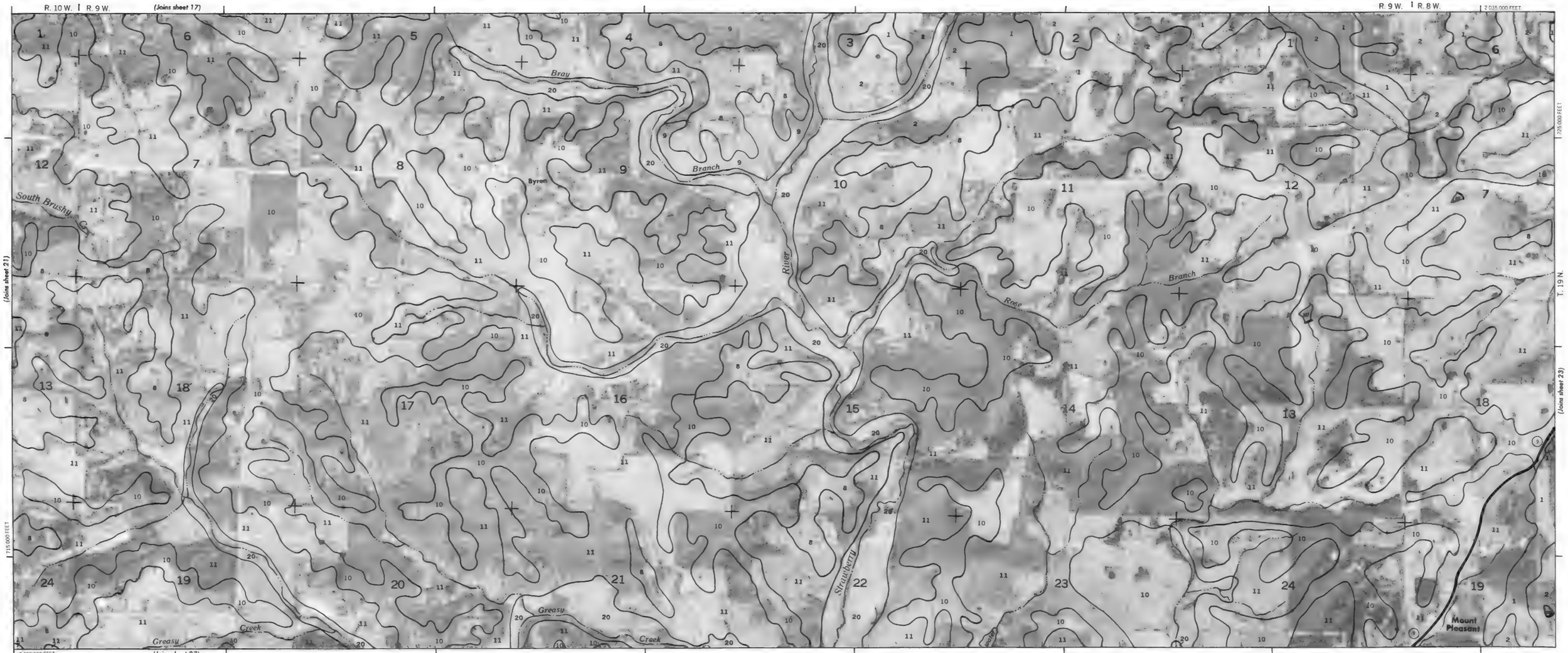
Scale - 1:20000

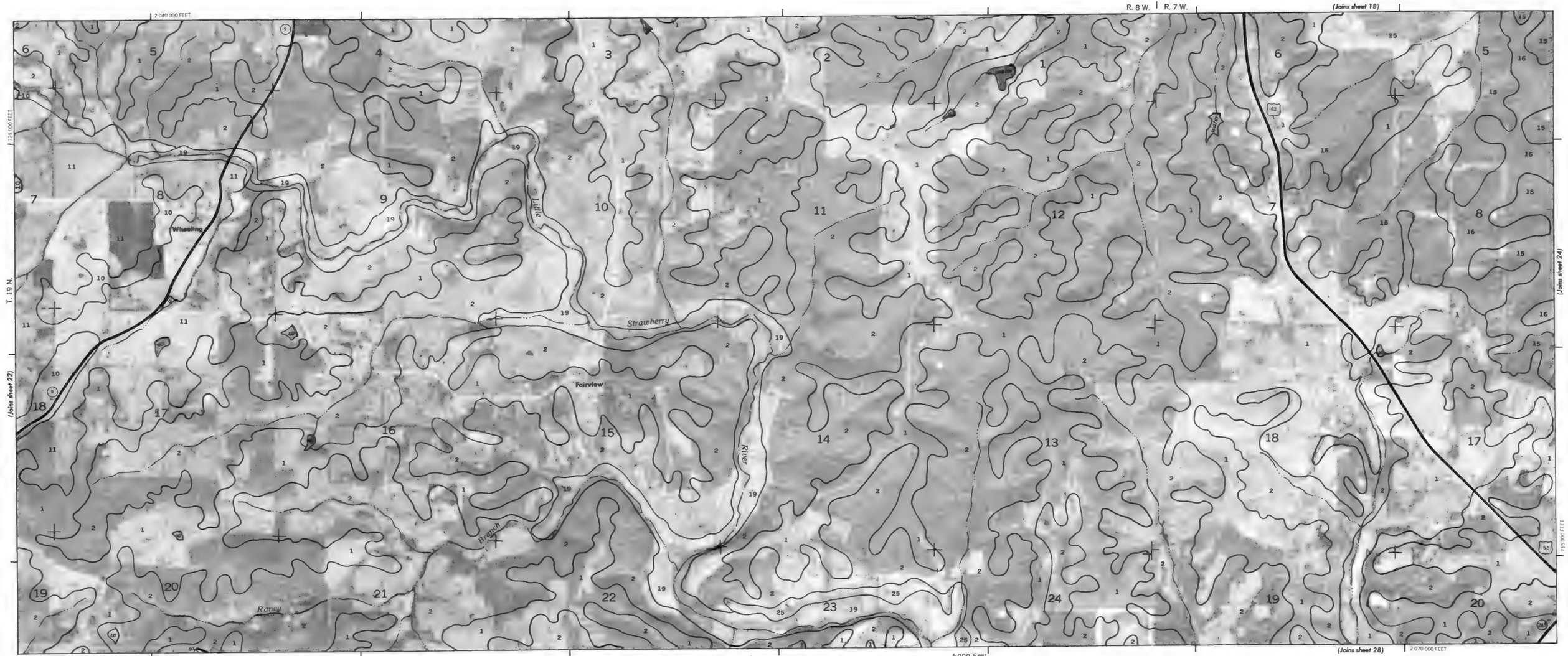

N
(Joins sheet 13)
R. 8 W.
R. 7 W.
2 070 000 FEET
2 040 000 FEET
(Joins sheet 23)
(Joins sheet 17)
(Joins sheet 19)
T. 19 N.
T. 20 N.
SALEM
(county seat)
Moore
Branch
Town
Branch
water
water
Hollow
Wheeler
SOUTH
FORK
SPRING
RIVER
Horton Br
Pinhook
Bend
S. FORK SPRING R.
water
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


R. 7 W.
R. 6 W.
T. 20 N.
T. 19 N.
2 075 000 FEET
2 110 000 FEET
740 000 FEET
730 000 FEET
(Joins sheet 14)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 24)
SOUTH FORK SPRING RIVER
S FK SPRING R
SPRING RIVER
SOUTH FORK SPRING RIVER
Cherry Hollow Br
County Line Branch
Mill Pond Branch
French
Saddle
Creek
Pond
Lick Creek
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


N
(Joins sheet 15)
R. 6 W.
R. 5 W.
2 145 000 FEET
(Joins sheet 19)
(Joins sheet 49)
T. 19 N.
T. 20 N.
2 130 000 FEET
2 115 000 FEET
(Joins sheet 25)
Wolf Creek
Myatt Creek
Hollow
Spring
Good
Mill
Hollow
water
FK
SOUTH
SPRING
RIVER
SOUTH
SPRING
RIVER
FORK
Myatt Cr.
Gulf Cr.
Wolf Hol
SPRING
Scrabble Cr
BURLINGTON NORTHERN
Bee Gum
Hollow
Ray
Hollow
RIVER
SHARP COUNTY
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

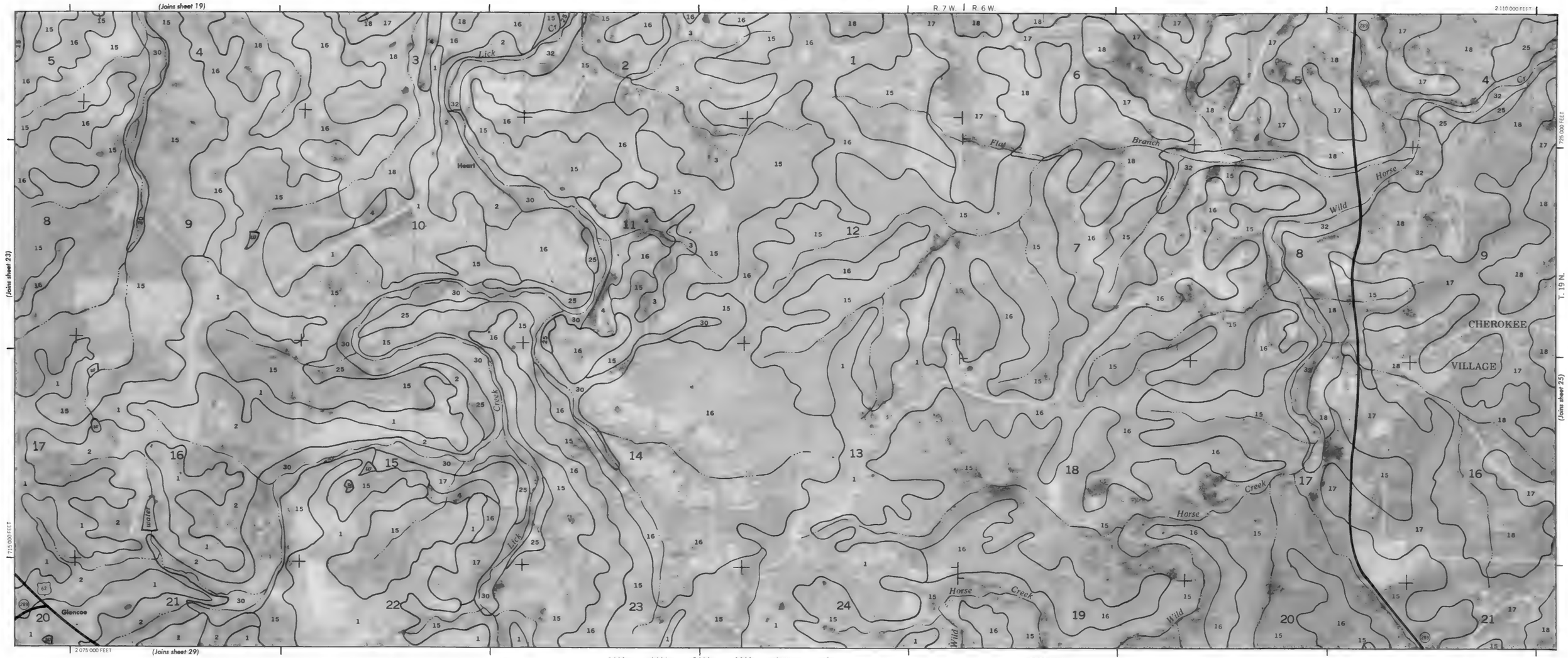

1 965 000 FEET
R. 11 W.
R. 10 W.
(Joins sheet 16)
725 000 FEET
T. 19 N.
(Joins inset, sheet 39)
(Joins sheet 22)
715 000 FEET
2 000 000 FEET
(Joins sheet 26)
Elizabeth
Mitchell
NORFORK LAKE
Big Creek
Brushy
South
Creek
Huddleston
S Brushy Cr
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

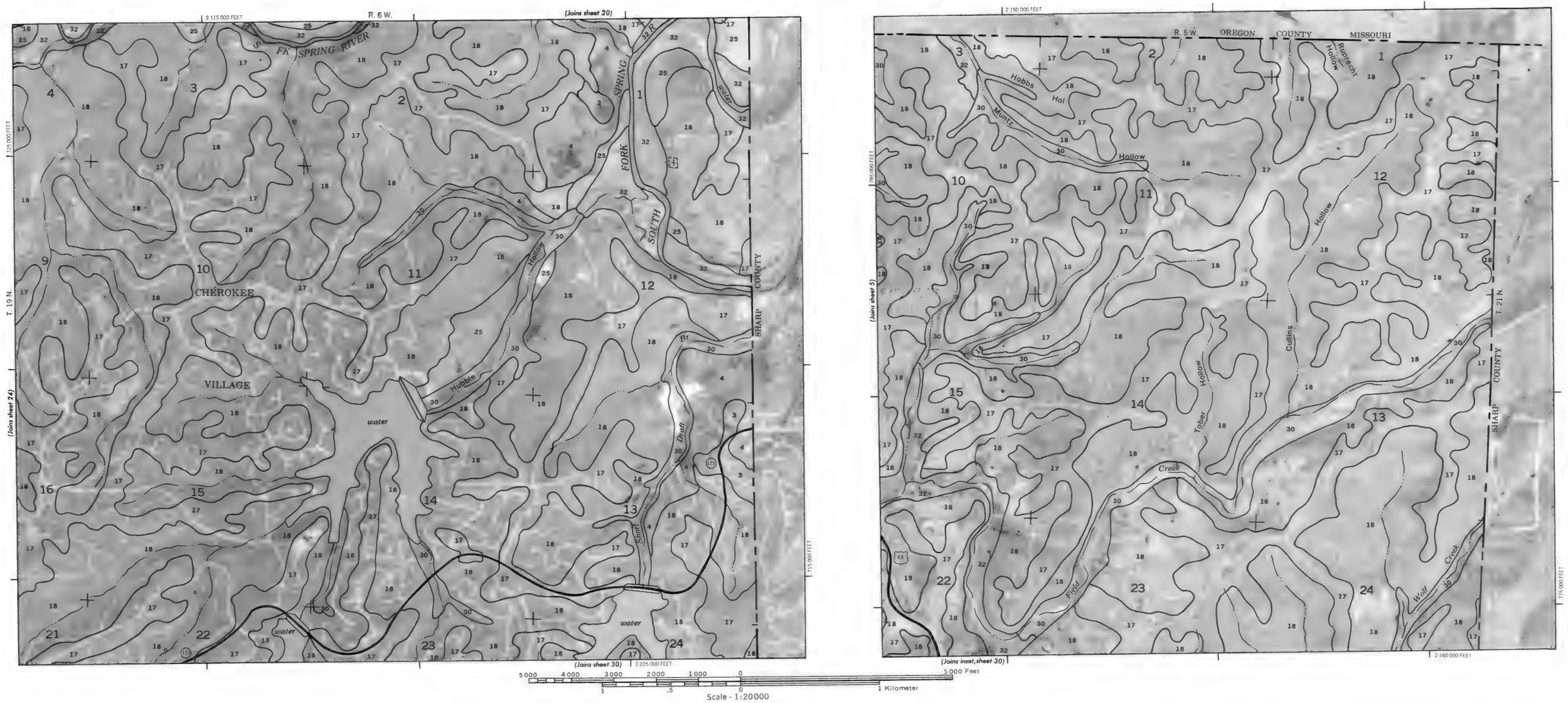

N
R. 10 W.
R. 9 W.
(Joins sheet 17)
R. 9 W.
R. 8 W.
2 035 000 FEET
725 000 FEET
T. 19 N.
(Joins sheet 21)
(Joins sheet 23)
215 000 FEET
2 000 000 FEET
(Joins sheet 27)
Bray
Branch
Byron
South Brushy
River
Rose
Branch
Strawberry
Greasy
Creek
Greasy
Creek
Mount Pleasant
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 1 Kilometer
Scale - 1:20000

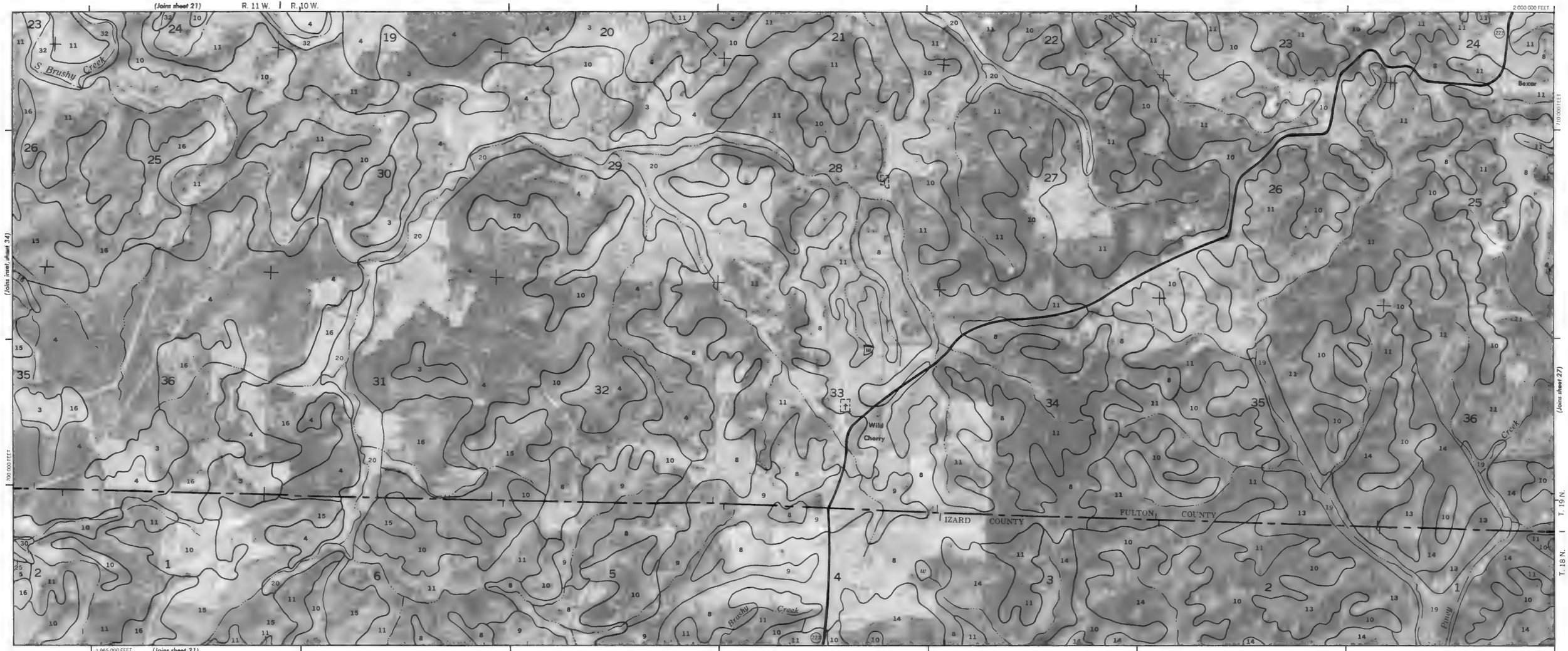

2 040 000 FEET
R. 8 W.
R. 7 W.
(Joins sheet 18)
T. 19 N.
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 28)
2 070 000 FEET
715 000 FEET
Wheeling
Little
Strawberry
Fairview
River
Branch
Ramey
Beaver
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

23

N


N
(Joins sheet 19)
R. 7 W.
R. 6 W.
2 110 000 FEET
725 000 FEET
T. 19 N.
(Joins sheet 23)
(Joins sheet 25)
715 000 FEET
2 075 000 FEET
(Joins sheet 29)
Lick Cr
Heart Creek
Flat Branch
Horse Wild Creek
Lick Creek
Horse Creek
Wild Horse Creek
CHEROKEE VILLAGE
Glencoe
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


N
2 115 000 FEET
R. 6 W.
(Joins sheet 20)
S FK SPRING RIVER
SPRING FORK
SOUTH
Hollow
water
CHÉROKEE
VILLAGE
SHARP COUNTY
Hubble
Draft
Short
T. 19 N.
(Joins sheet 24)
2 225 000 FEET
(Joins sheet 30)
2 150 000 FEET
R. 5 W.
OREGON COUNTY
MISSOURI
Hobbs Hol
Muntz
Hollow
Runrecht Hollow
Cullins Hollow
Tober Creek
Field
Wolf Creek
T. 21 N.
(Joins sheet 5)
(Joins inset, sheet 30)
2 160 000 FEET
725 000 FEET
715 000 FEET
775 000 FEET
5 000 Feet
1 Kilometer
Scale - 1:20000


N
(Joins sheet 21)
R. 11 W.
R. 10 W.
2 000 000 FEET
S Brushy Creek
Bexar
710 000 FEET
(Joins inset, sheet 34)
700 000 FEET
(Joins sheet 27)
Wild Cherry
IZARD COUNTY
FULTON COUNTY
T. 19 N.
T. 18 N.
Brushy Creek
Piney Creek
1 965 000 FEET
(Joins sheet 31)
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 27

N

R. 10 W. | R. 9 W.

2 000 000 FEET

(Joins sheet 22) R. 9 W. | R. 8 W.

Boxer

Greasy Cr.

Strawberry

Cochran

Branch

River

Union

FULTON COUNTY

IZARD COUNTY

water

T. 19 N.

T. 18 N.

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 32)

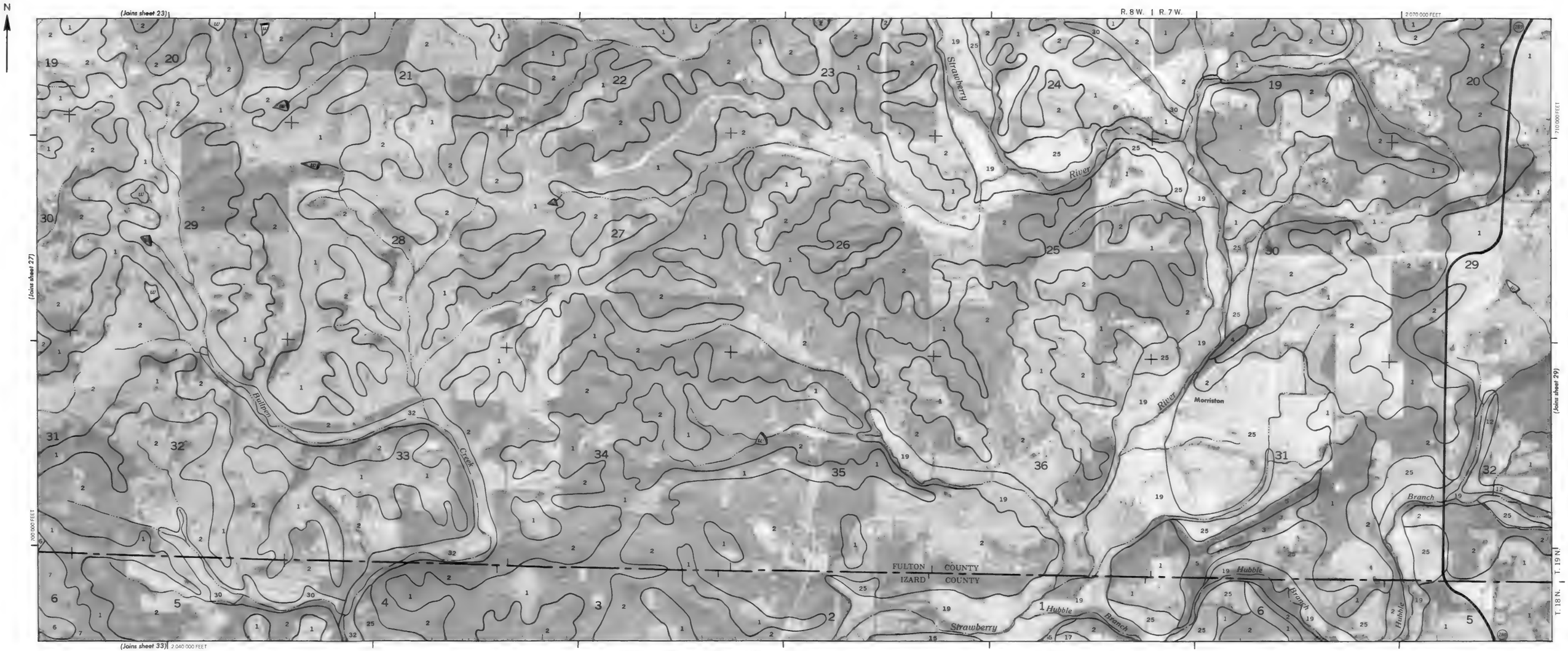
2 035 000 FEET

300 000 FEET

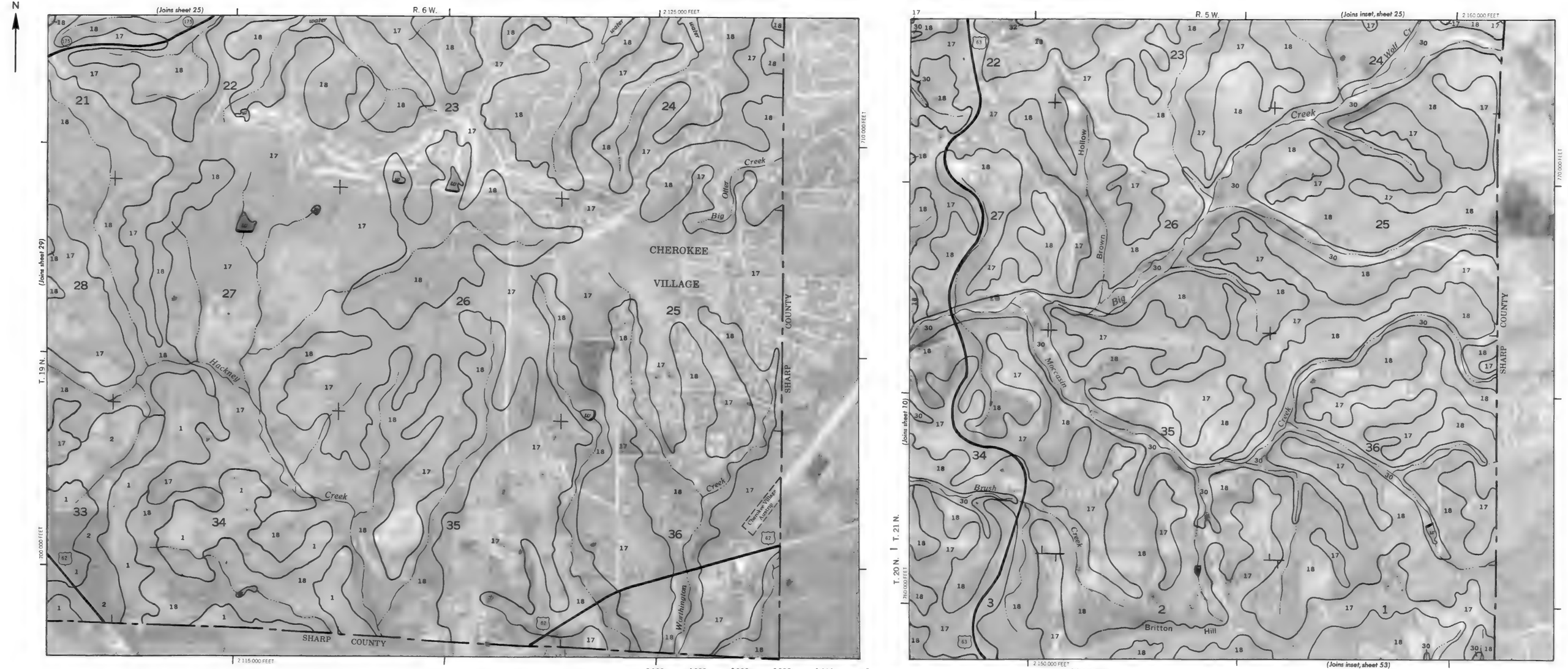
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

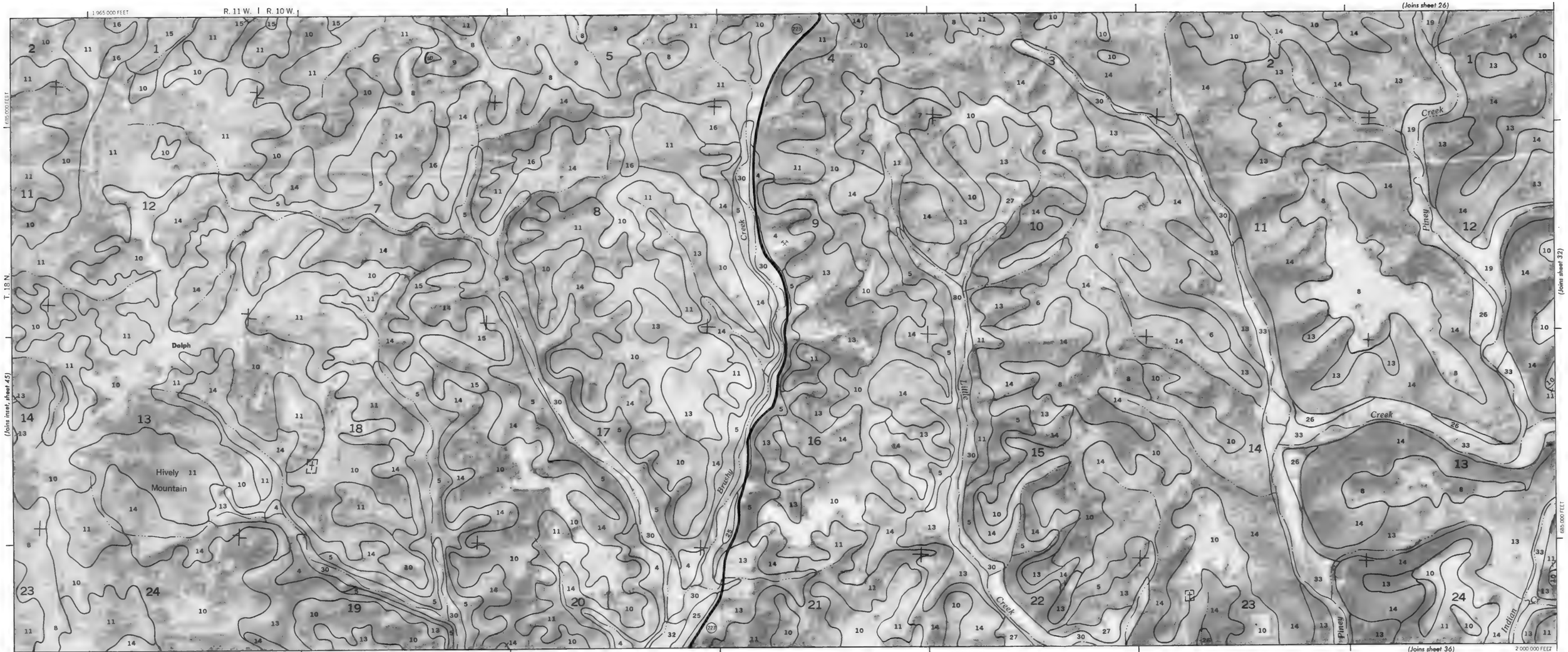
1 .5 0 1 Kilometer

Scale - 1:20000


(28)
N
(Joins sheet 23)
R. 8 W. | R. 7 W.
2 070 000 FEET
710 000 FEET
(Joins sheet 27)
(Joins sheet 29)
200 000 FEET
(Joins sheet 33)
2 040 000 FEET
Strawberry River
Buffington Creek
Morriston
Branch
Hubble Branch
FULTON COUNTY
IZARD COUNTY
T. 19 N.
T. 18 N.
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 29


N
(Joins sheet 25)
R. 6 W.
2,125,000 FEET
(Joins sheet 29)
T. 19 N.
700,000 FEET
2,115,000 FEET
CHEROKEE VILLAGE
SHARP COUNTY
Hackney
Creek
Big Otter Creek
Washington
Cherokee Village Airport
R. 5 W.
(Joins inset, sheet 25)
2,160,000 FEET
710,000 FEET
Wolf Cr.
Hollow
Brown
Big
Mincasin
Creek
Brush
Creek
Britton Hill
(Joins sheet 10)
T. 21 N.
T. 20 N.
760,000 FEET
2,150,000 FEET
(Joins inset, sheet 53)
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


1 965 000 FEET
R. 11 W.
R. 10 W.
(Joins sheet 26)
685 000 FEET
T. 19 N.
(Joins inset, sheet 45)
(Joins sheet 32)
Dolph
Hively Mountain
Brushy Creek
Piney Creek
Indian Creek
(Joins sheet 36)
2 000 000 FEET
N
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


N
R. 10 W.
R. 9 W.
R. 9 W.
R. 8 W.
(Joins sheet 27)
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 37)
2 035 000 FEET
695 000 FEET
685 000 FEET
2 000 000 FEET.
T. 18 N.
Thorn Hill
Indian Creek
Water
Oxford
Strawberry River
Sandy Creek
Powell Creek
Creek
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 33

N

(Joins sheet 29) R. 7 W. 2 095 000 FEET

(Joins sheet 33) 695 000 FEET

(Joins sheet 26)

2 075 000 FEET (Joins sheet 39)

R. 11 W. 1 960 000 FEET (Joins inset, sheet 39)

710 000 FEET

700 000 FEET

1 955 000 FEET (Joins inset, sheet 45)

HORSESHOE BEND

NORFORK LAKE

NORFORK LAKE

Day Creek

Bens Creek

S Brushy Ck

water

water

water

SHARP COUNTY

BAXTER COUNTY

FULTON COUNTY

IZARD COUNTY

T. 18 N.

T. 19 N.

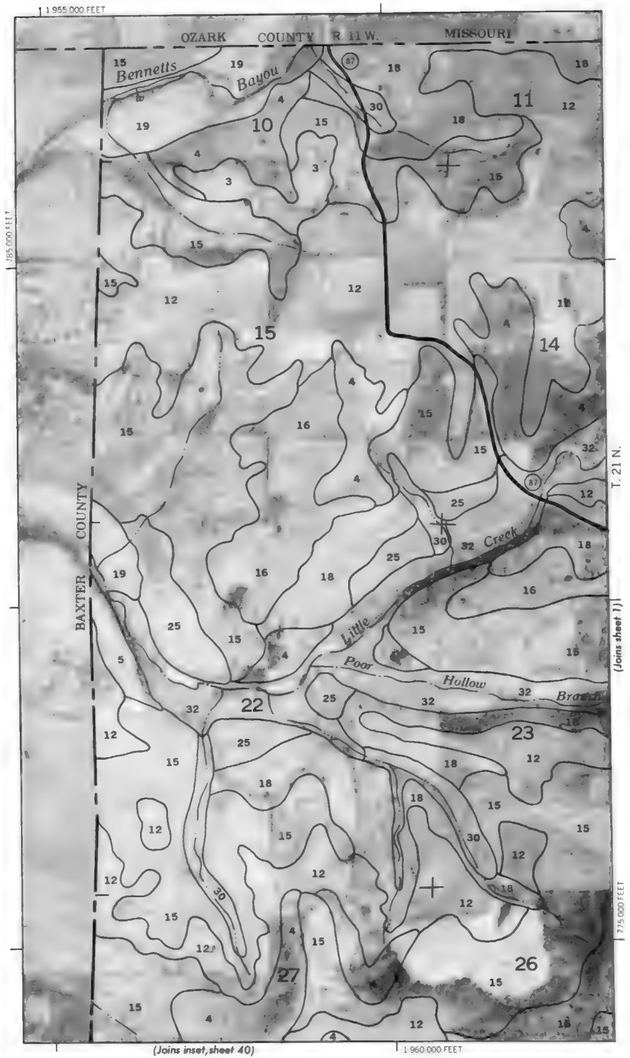
T. 18 N.

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

1 .5 0 1 Kilometer

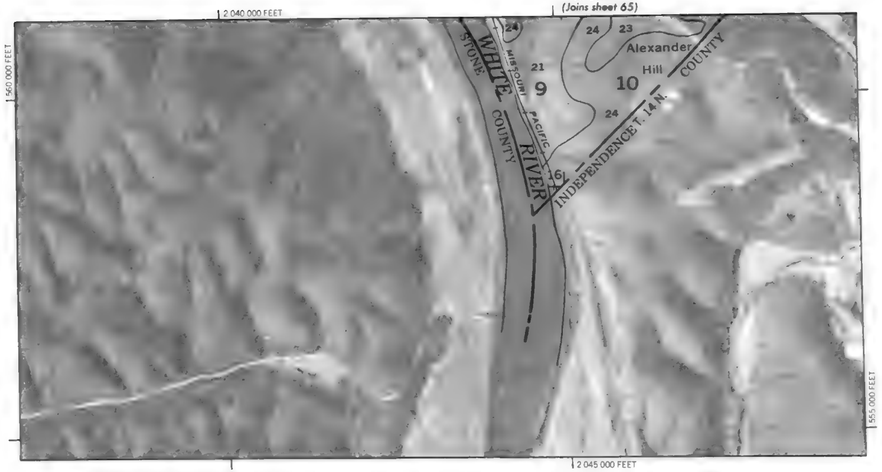
Scale - 1:20000

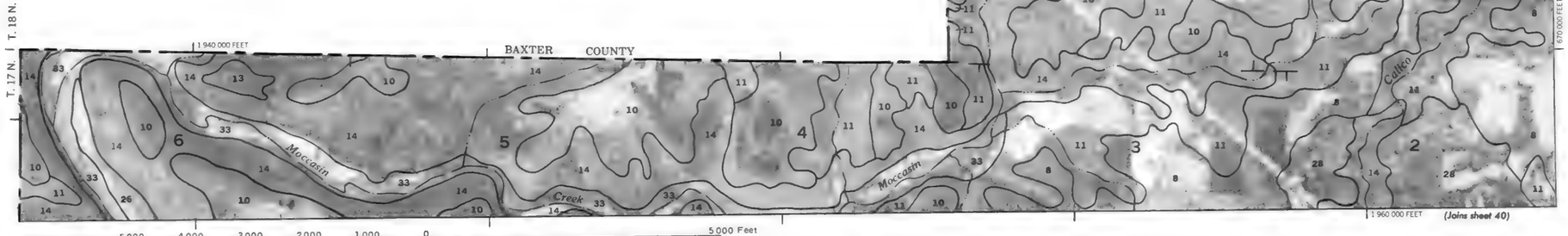
INSET A

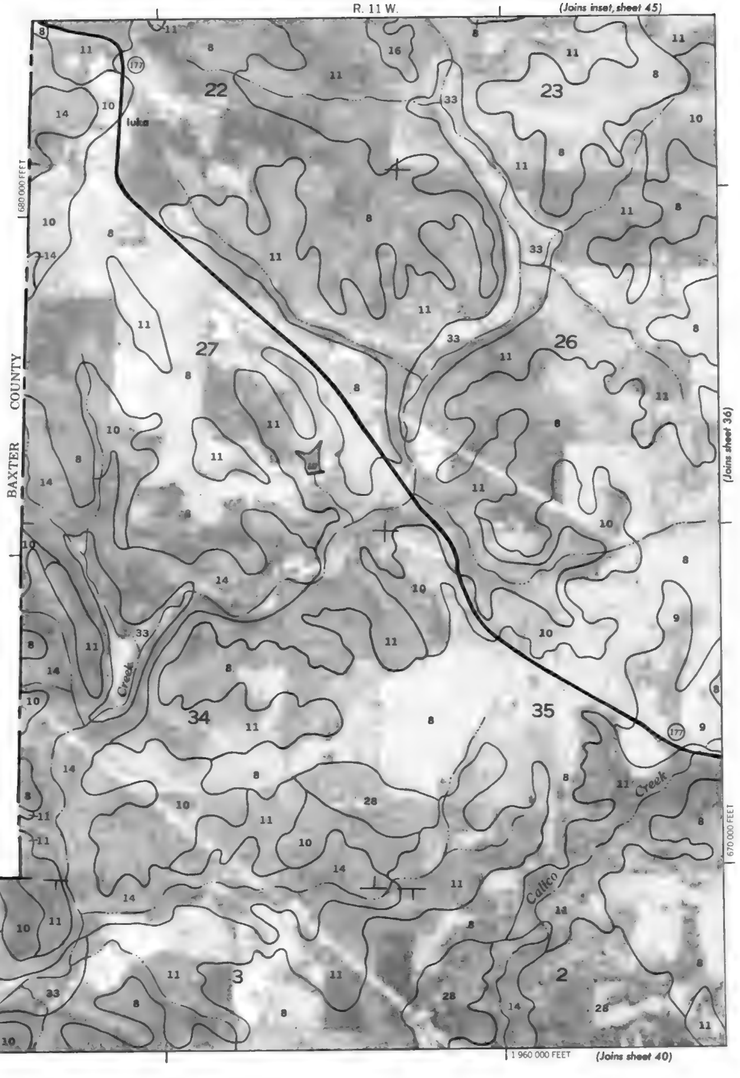


INSET B

R. 8 W.
(Joins sheet 65)







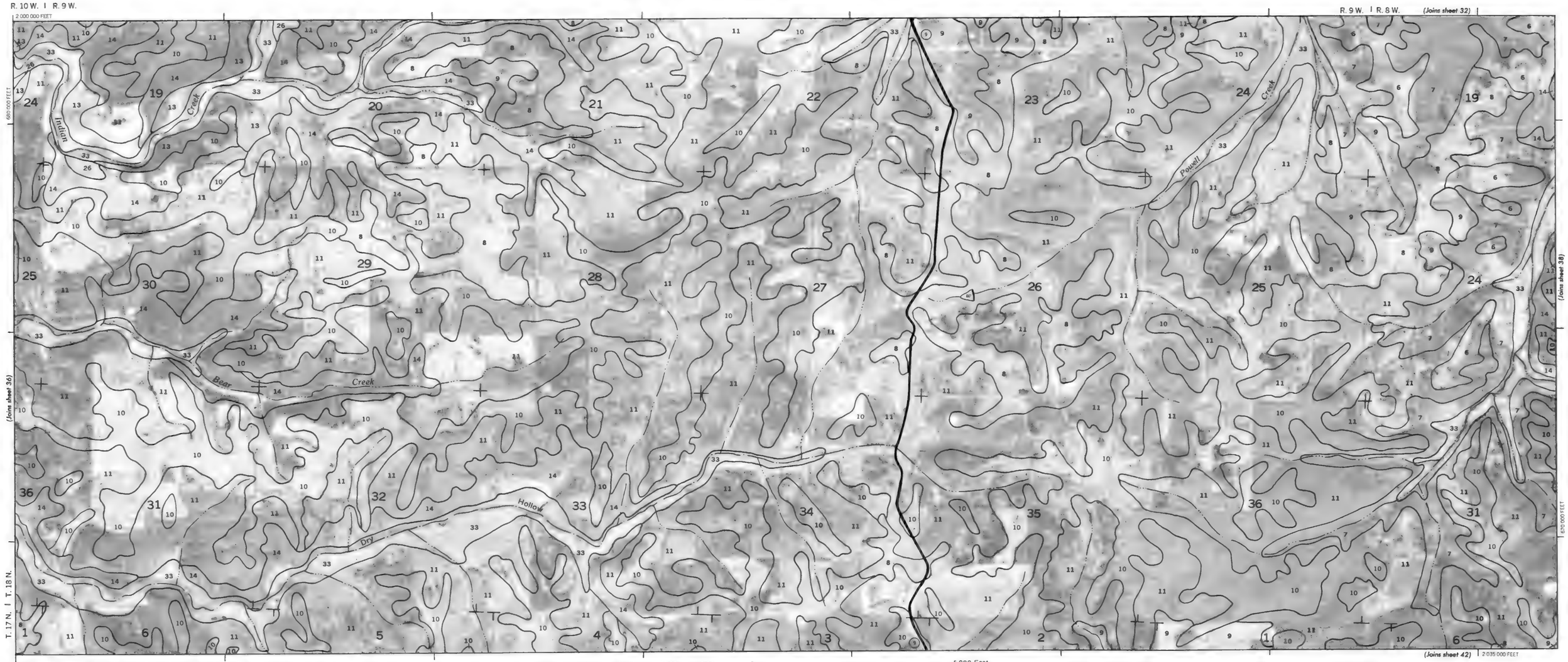
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

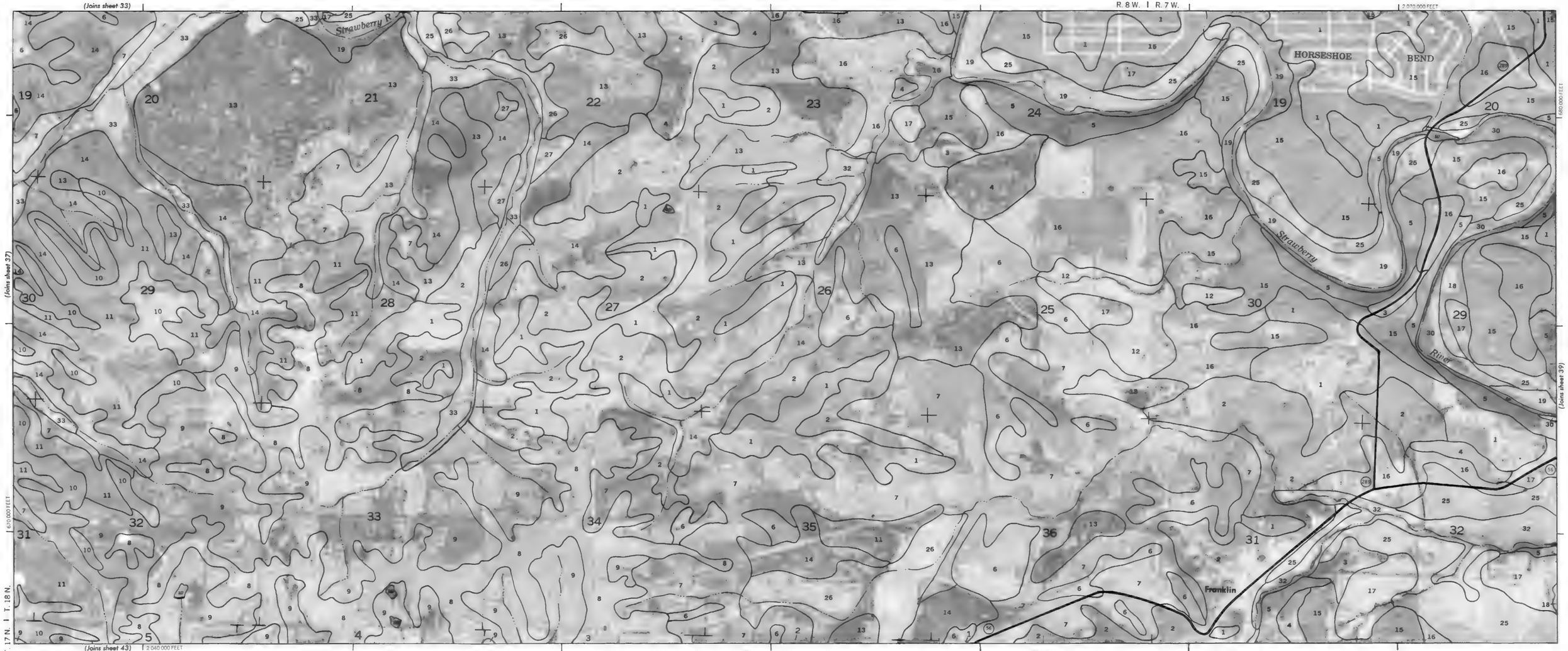
1 .5 0 1 Kilometer

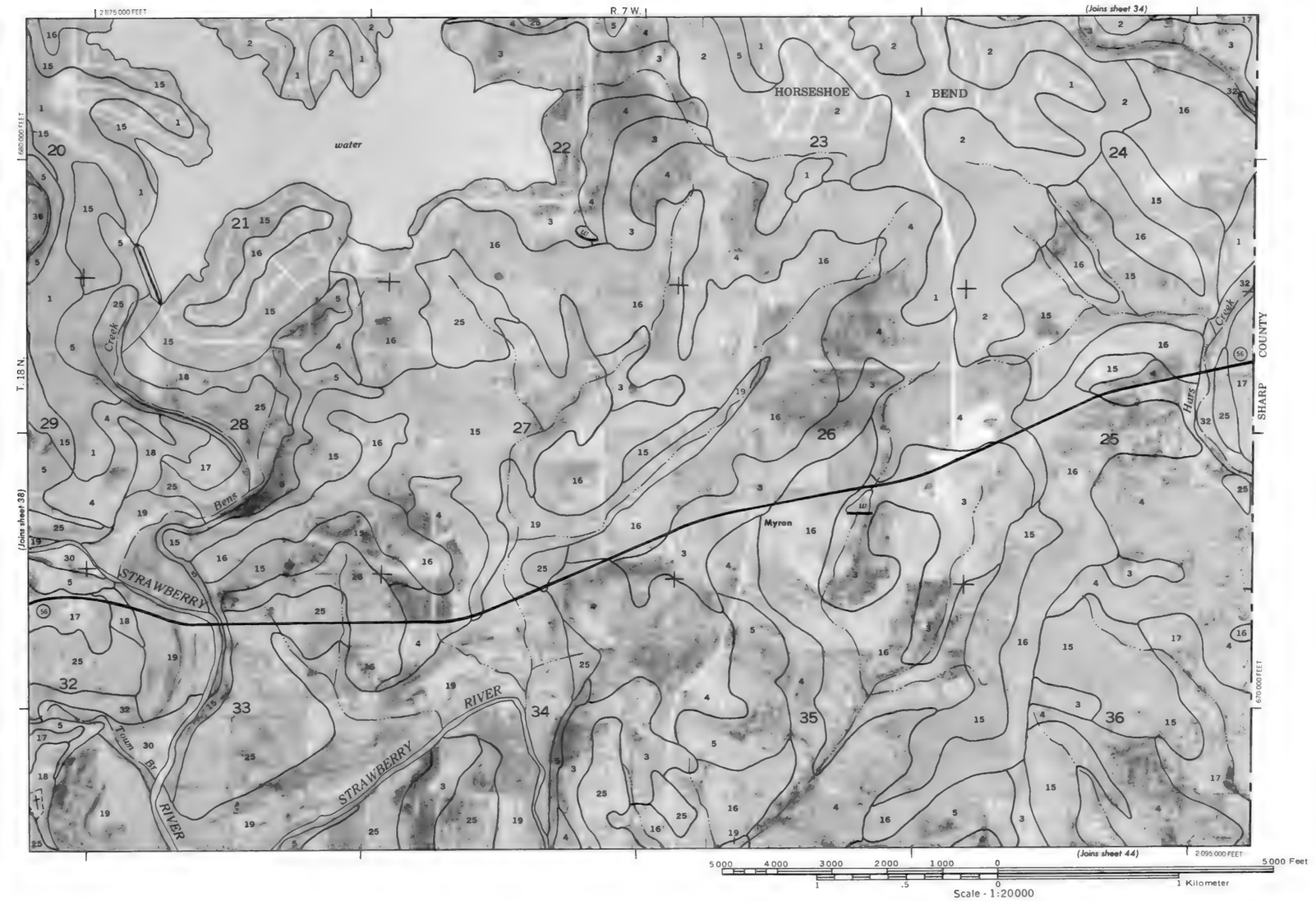
Scale - 1:20000

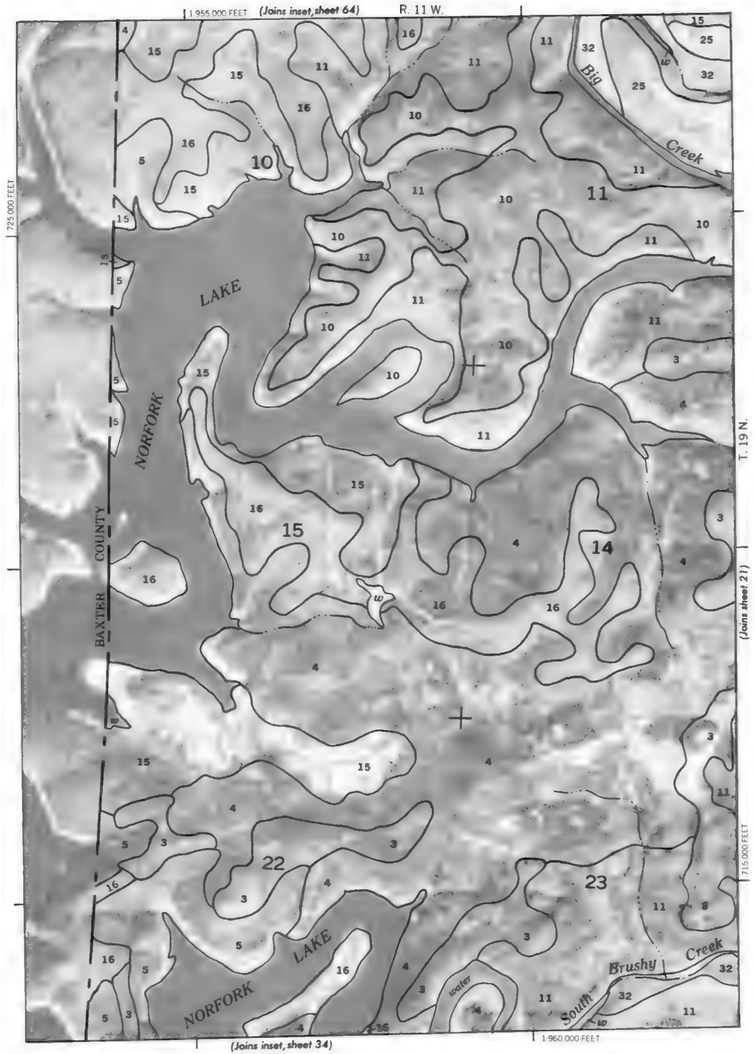
N


N
(Joins sheet 31)
R. 11 W.
R. 10 W.
2 000 000 FEET
680 000 FEET
(Joins sheet 35)
(Joins sheet 37)
1 670 000 FEET
1 965 000 FEET
(Joins sheet 41)
T. 17 N.
T. 18 N.
Crossroads
Little
Brushy
Creek
Piney
Dry
Indian
Bear
Widaman
Holbw
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


R. 10 W. | R. 9 W.
R. 9 W. | R. 8 W.
(Joins sheet 32)
2 000 000 FEET
680 000 FEET
T. 17 N. | T. 18 N.
(Joins sheet 36)
(Joins sheet 38)
(Joins sheet 42)
2 035 000 FEET
670 000 FEET
Indian Creek
Bear Creek
Dry Hollow
Powell Creek
N
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

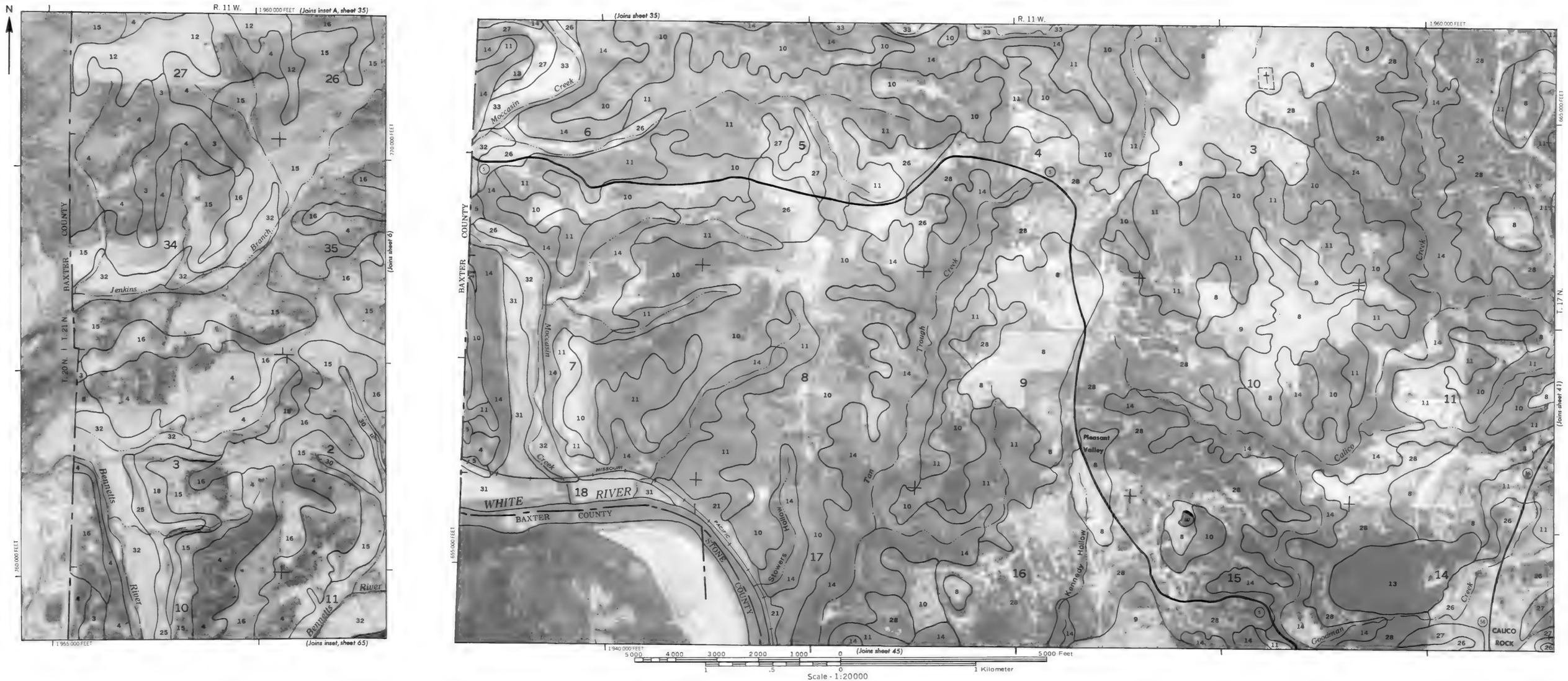

N
(Joins sheet 33)
R. 8 W. I R. 7 W.
2 070 000 FEET
Strawberry R.
HORSESHOE
BEND
Strawberry
River
Franklin
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 43)
2 040 000 FEET
670 000 FEET
680 000 FEET
T. 17 N. I T. 18 N.
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

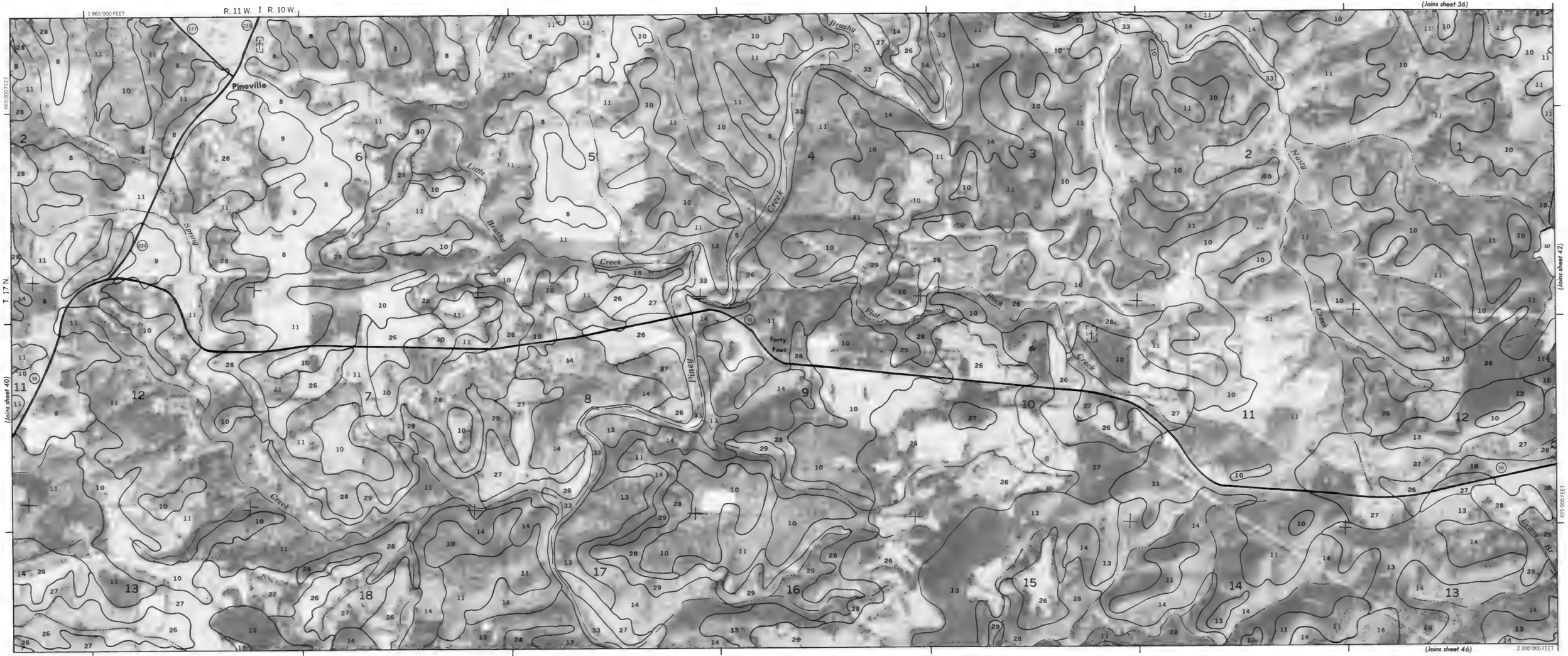

2 875 000 FEET
R. 7 W.
(Joins sheet 34)
680 000 FEET
T. 18 N.
(Joins sheet 38)
HORSESHOE BEND
water
Creek
Bens
STRAWBERRY
RIVER
Town Br
Myron
Hurst Creek
SHARP COUNTY
(Joins sheet 44)
2 095 000 FEET
670 000 FEET
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

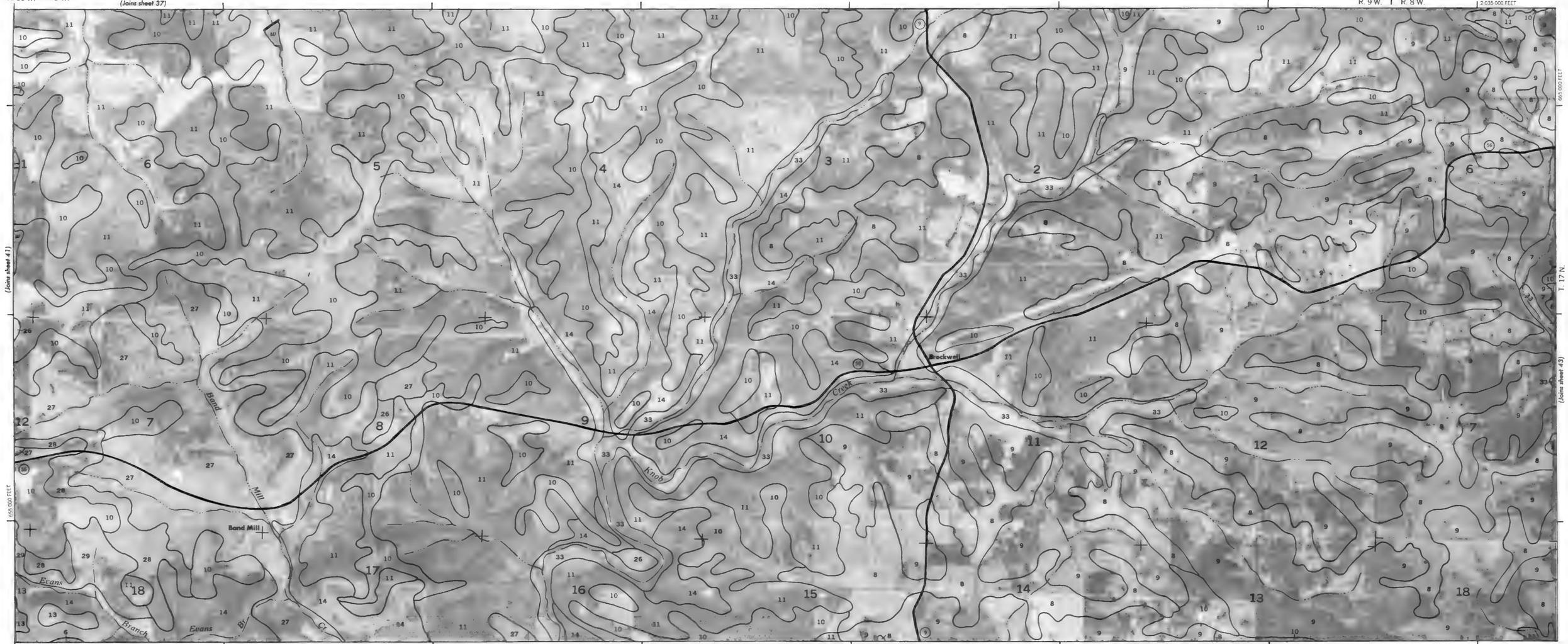

1 955 000 FEET
(Joins inset, sheet 64)
R. 11 W.
725 000 FEET
T. 19 N.
(Joins sheet 21)
Big Creek
LAKE
NORFORK
BAXTER COUNTY
NORFORK LAKE
Brushy Creek
South
water
715 000 FEET
(Joins inset, sheet 34)
1 960 000 FEET

N

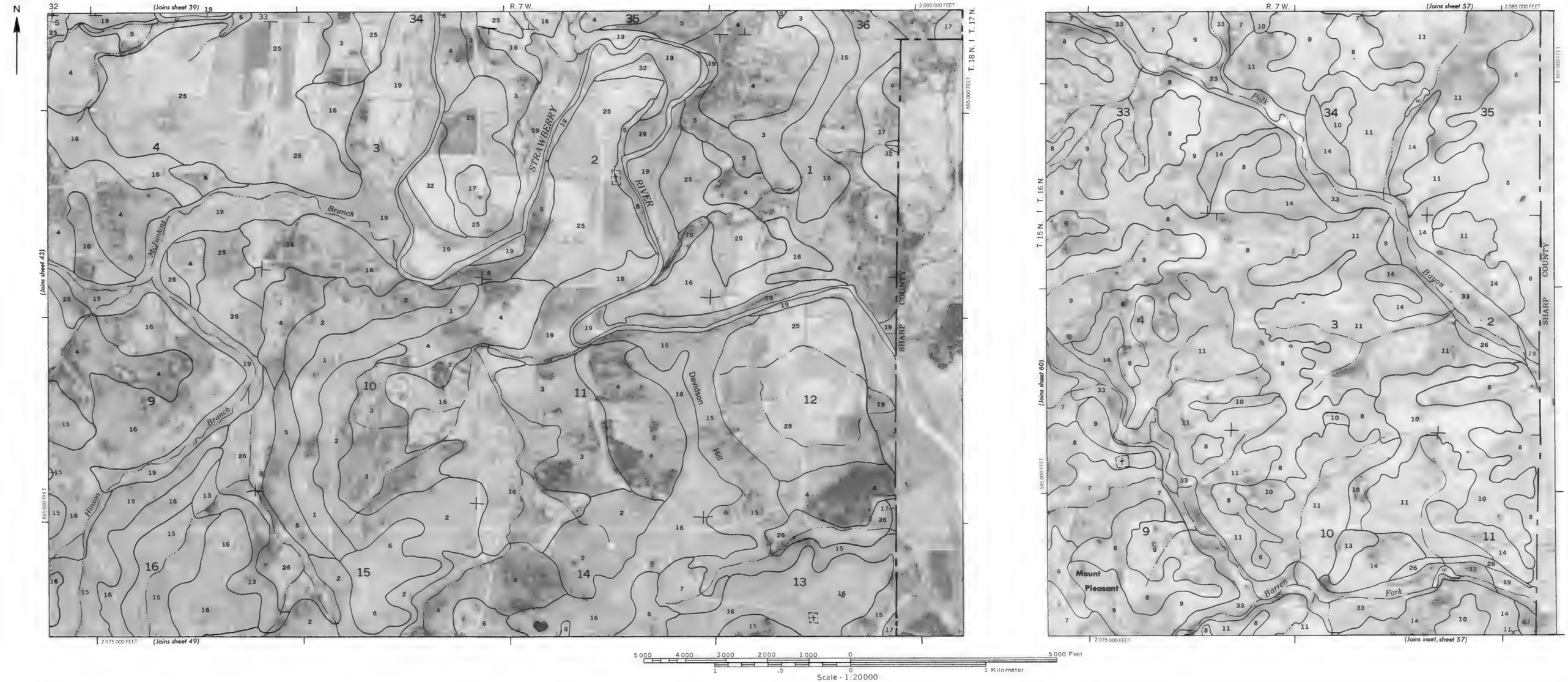
FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 40

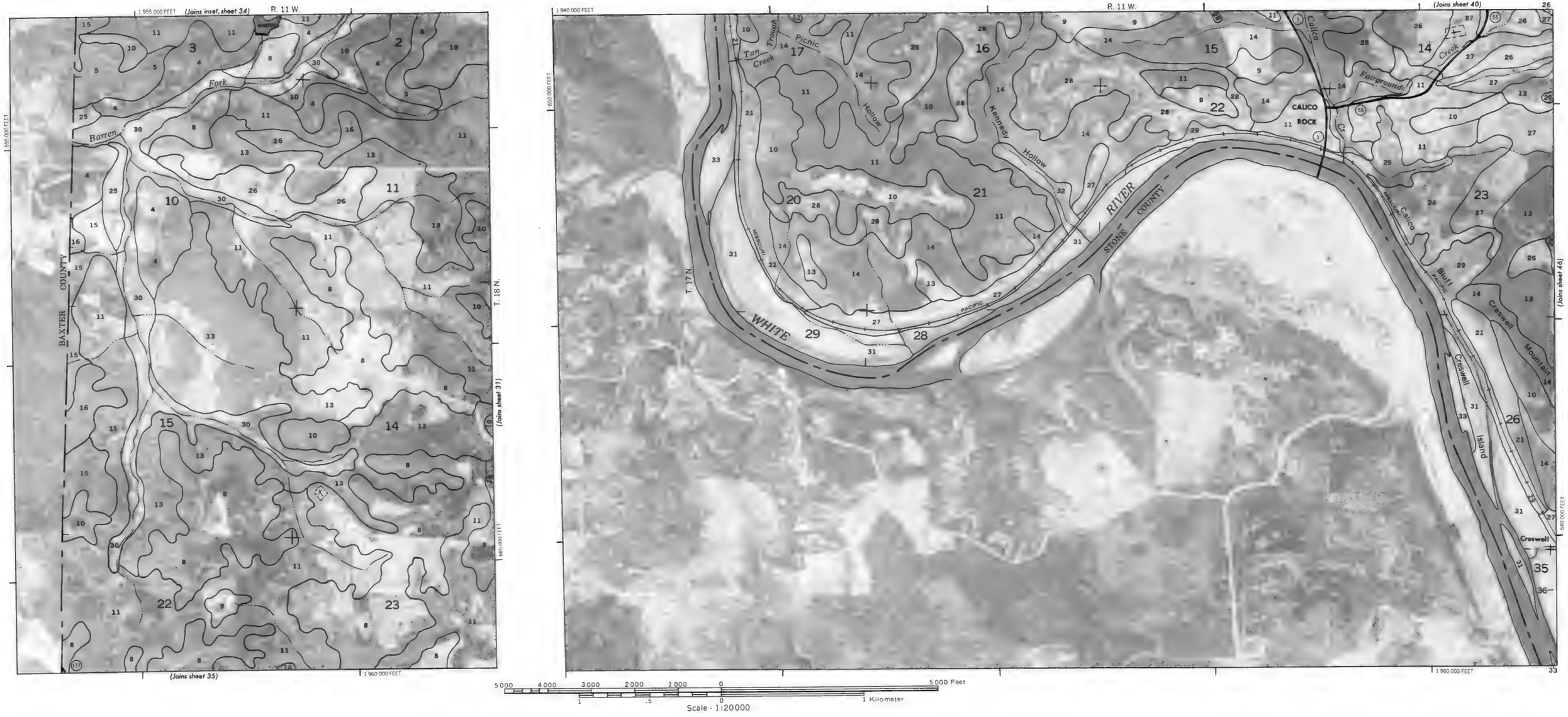


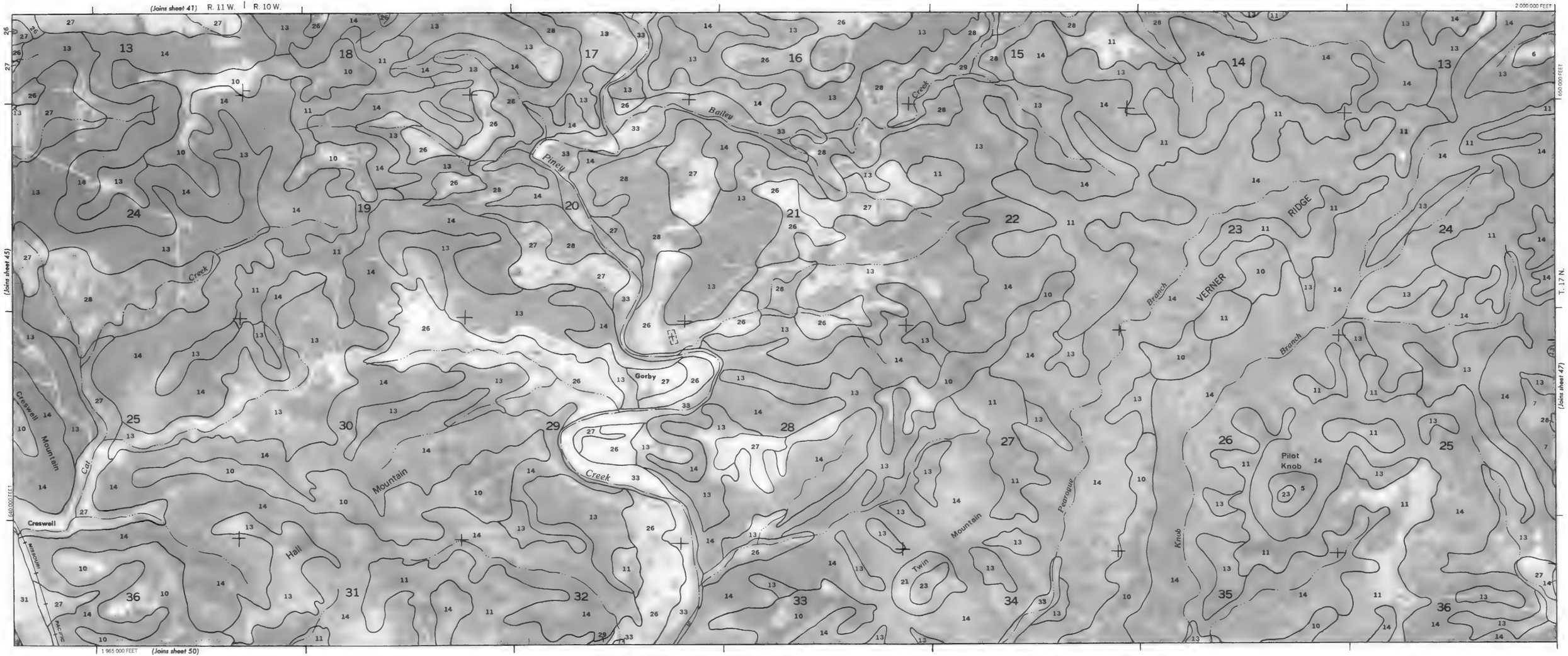

1 965 000 FEET
R. 11 W.
R. 10 W.
(Joins sheet 36)
665 000 FEET
T. 17 N.
(Joins sheet 40)
(Joins sheet 42)
655 000 FEET
Pineville
Little Brushy Creek
Spring Creek
Brushy Creek
Piney Creek
Forty Four Flat Rock Creek
Nasty Creek
Evans Br
(Joins sheet 46)
2 000 000 FEET
5000 4000 3000 2000 1000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

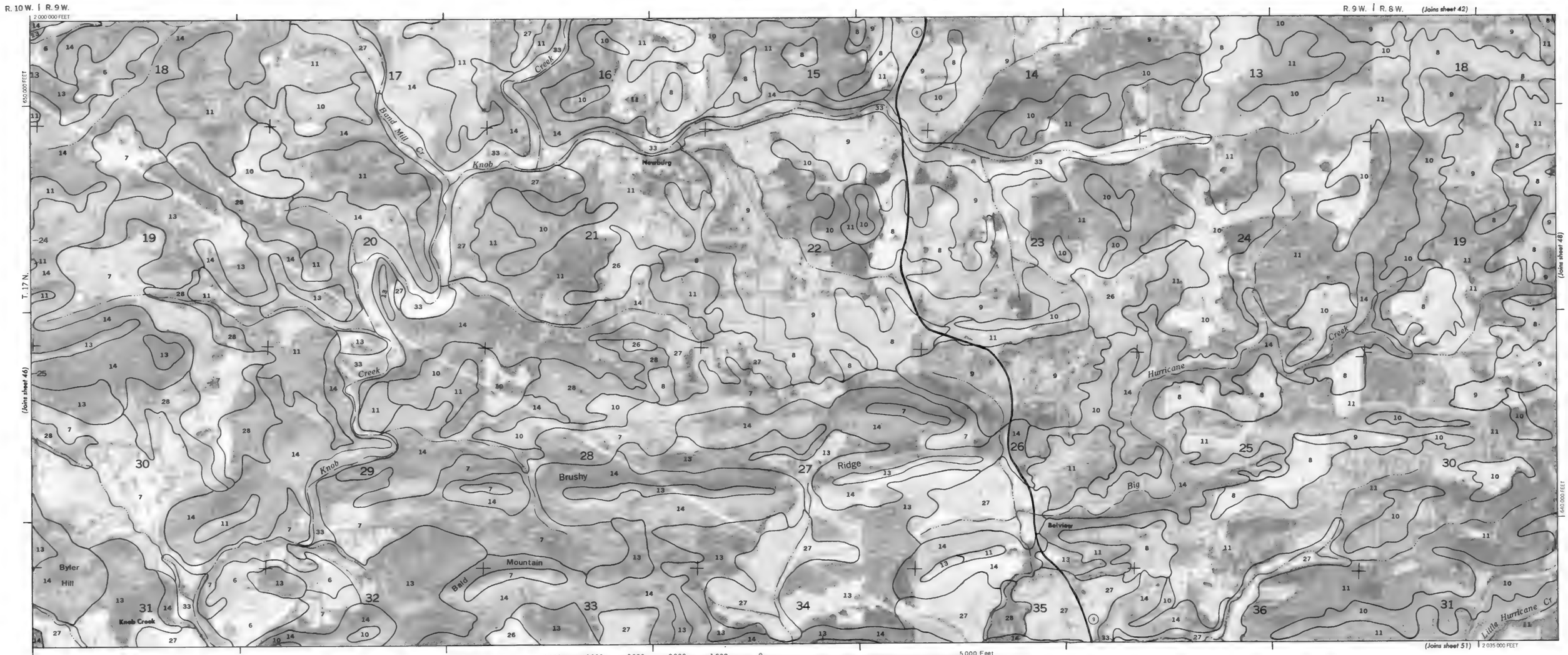

N
R. 10 W. I R. 9 W.
(Joins sheet 37)
R. 9 W. I R. 8 W.
2,035,000 FEET
660,000 FEET
T. 17 N.
(Joins sheet 41)
(Joins sheet 43)
655,000 FEET
2,000,000 FEET
(Joins sheet 47)
Band Mill Creek
Knob Creek
Band Mill
Rockwell
Evans Branch
Evans Br. Cr.
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

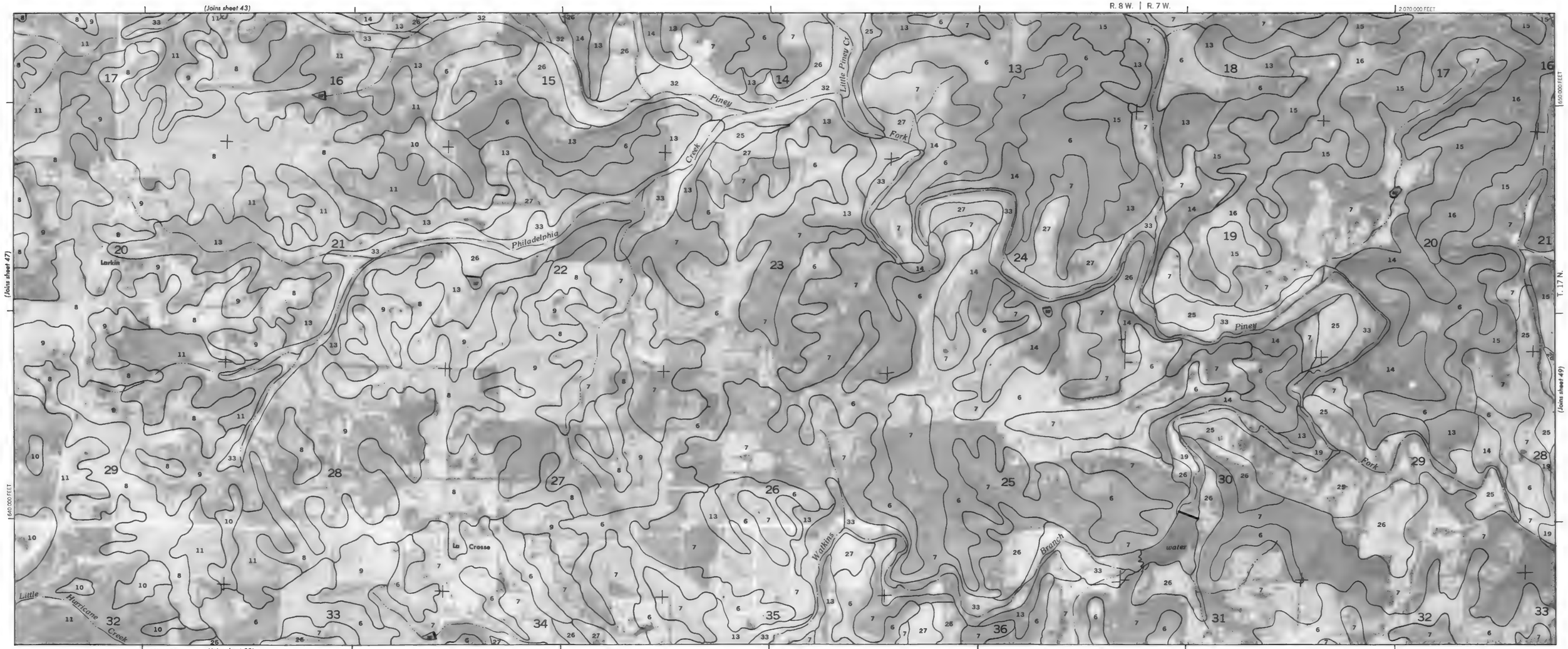

2 040 000 FEET
R. 8 W.
R. 7 W.
(Joins sheet 38)
665 000 FEET
T. 17 N.
(Joins sheet 42)
(Joins sheet 44)
655 000 FEET
(Joins sheet 48)
2 070 000 FEET
Violet Hill
Pinely
Little
Pinel
Fork
Creek
Branch
Burns Hill
McJunkins
N
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

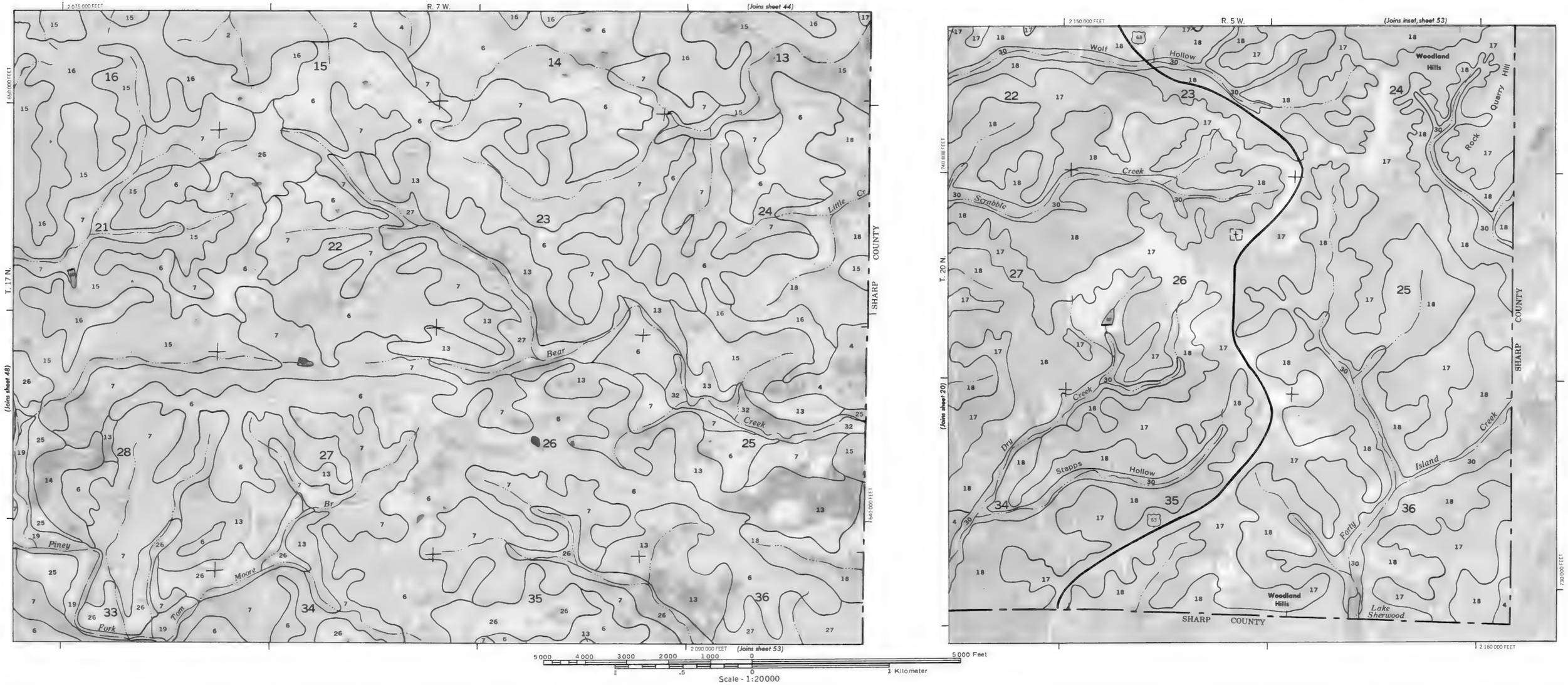

N
R. 7 W.
T. 18 N.
T. 17 N.
T. 16 N.
T. 15 N.
(Joins sheet 39)
(Joins sheet 43)
(Joins sheet 49)
(Joins sheet 57)
(Joins sheet 60)
(Joins inset, sheet 57)
2 095 000 FEET
2 085 000 FEET
2 075 000 FEET
665 000 FEET
595 000 FEET
SHARP COUNTY
STRAWBERRY RIVER
Davidson Hill
Hinson Branch
McLanahan Branch
Polk Bayou
Barren Fork
Mount Pleasant
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

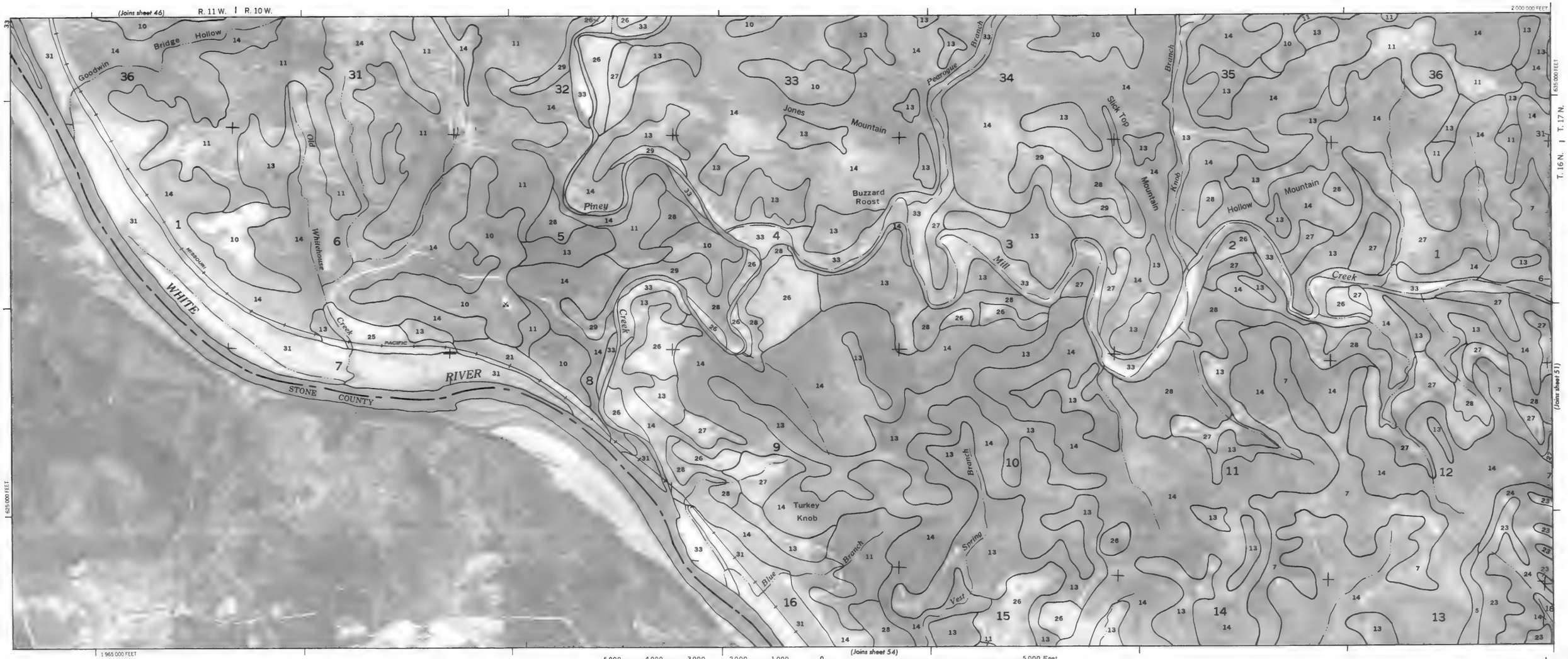

N
1 955 000 FEET
(Joins inset, sheet 34)
R. 11 W.
1 940 000 FEET
(Joins sheet 40)
695 000 FEET
650 000 FEET
640 000 FEET
685 000 FEET
T. 18 N.
T. 17 N.
(Joins sheet 31)
(Joins sheet 46)
(Joins sheet 35)
1 960 000 FEET
BAXTER COUNTY
STONE COUNTY
WHITE RIVER
Barren Fork
Tan Trough Creek
Picnic Hollow
Kennedy Hollow
Calico Creek
Fairgrounds
CALICO ROCK
Cr.
Bluff
Creswell Mountain
Creswell Island
Creswell
PACIFIC
MISSOURI
WRECKOUT
water
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


N
(Joins sheet 41)
R. 11 W.
R. 10 W.
2 000 000 FEET
1 650 000 FEET
T. 17 N.
(Joins sheet 45)
(Joins sheet 47)
1 965 000 FEET
(Joins sheet 50)
Bailey
Piney
Creek
Gorby
Creswell
Mountain
Cat
Creek
Hall
Mountain
Creek
Twin
Mountain
Peprogue
Knob
VERNER
RIDGE
Branch
Branch
Pilot
Knob
Missouri
Pacific
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

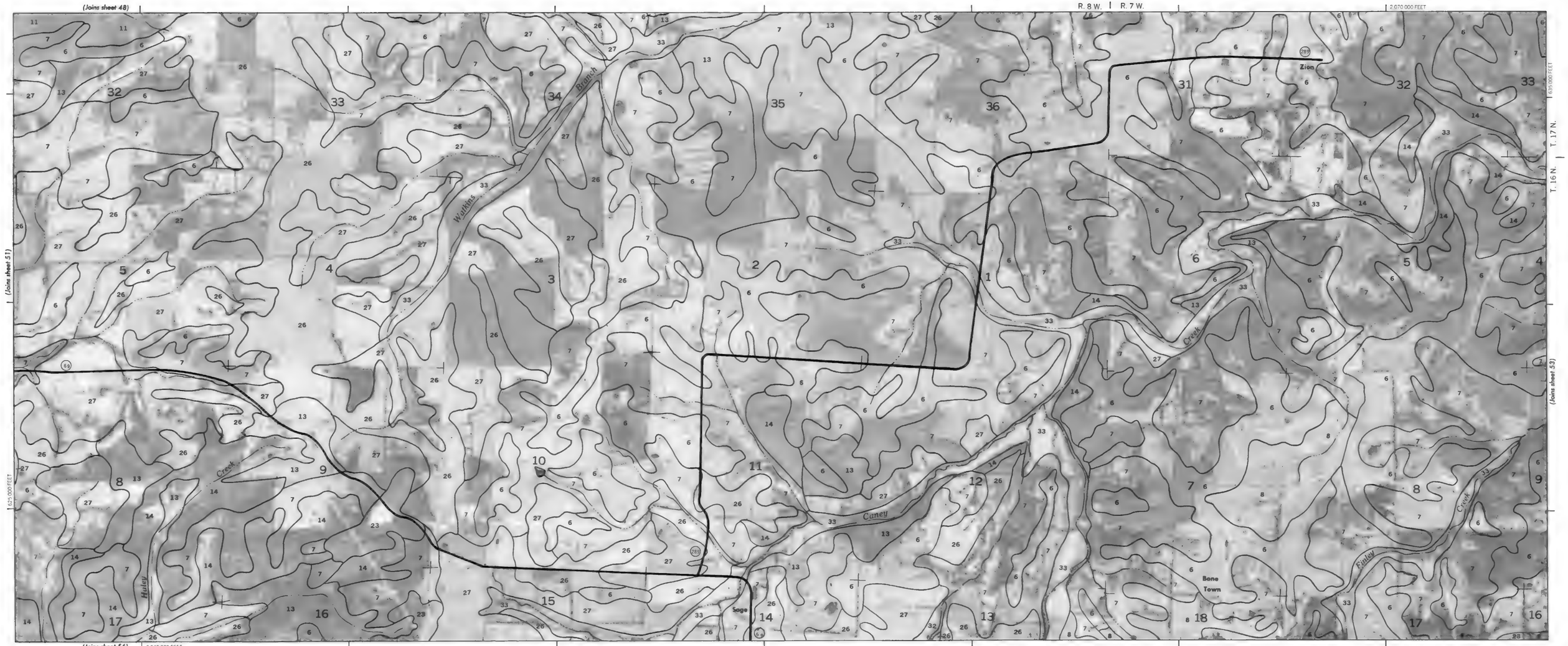

R. 10 W. | R. 9 W.
2 000 000 FEET
R. 9 W. | R. 8 W.
(Joins sheet 42)
650 000 FEET
T. 17 N.
(Joins sheet 46)
(Joins sheet 48)
640 000 FEET
(Joins sheet 51)
2 035 000 FEET
N
Bond Mill Cr.
Knob
Creek
Newburg
Knob
Creek
Brushy
Ridge
Hurricane
Creek
Big
Belview
Byler
Hill
Knob Creek
Bald
Mountain
Little Hurricane Cr.
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

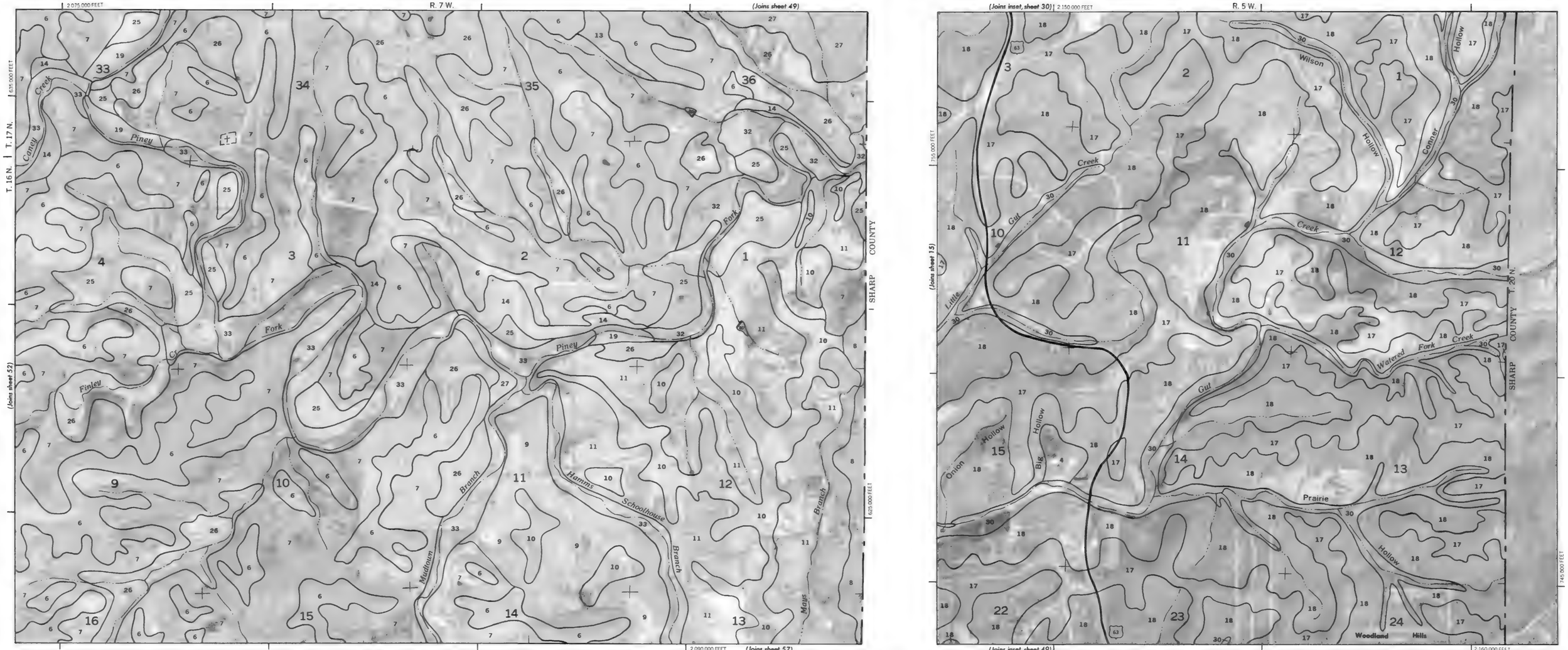

N
(Joins sheet 43)
R. 8 W. | R. 7 W.
2 070 000 FEET
650 000 FEET
(Joins sheet 47)
T. 17 N.
(Joins sheet 49)
600 000 FEET
2 040 000 FEET
(Joins sheet 52)
Little Piney Cr
Piney
Creek
Fork
Philadelphia
Larkin
La Cresse
Watkins
Branch
water
Little Hurricane Creek
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


2 075 000 FEET
R. 7 W.
(Joins sheet 44)
600 000 FEET
T. 17 N.
(Joins sheet 48)
SHARP COUNTY
640 000 FEET
2 090 000 FEET
(Joins sheet 53)
Little Cr
Bear
L Creek
Br
Piney
Moore
Tom
Fork
2 150 000 FEET
R. 5 W.
(Joins inset, sheet 53)
740 000 FEET
T. 20 N.
(Joins sheet 20)
Wolf
Hollow
Woodland Hills
Quarry
Hill
Rock
Creek
Scrabble
Dry
Stapps
Island
Forty
Lake Sherwood
730 000 FEET
2 160 000 FEET
5000 4000 3000 2000 1000 0 5000 Feet
.5 0 1 Kilometer
Scale - 1:20000


N
(Joins sheet 46)
R. 11 W. | R. 10 W.
2 000 000 FEET
635 000 FEET
625 000 FEET
1 965 000 FEET
T. 16 N. | T. 17 N.
(Joins sheet 51)
(Joins sheet 54)
R. 10 W. | R. 9 W.
Goodwin
Bridge
Hollow
Whitehouse
Creek
PACIFIC
MISSOURI
WHITE
RIVER
STONE
COUNTY
Piney
Creek
Jones
Mountain
Buzzard
Roost
Pearogue
Branch
Stick Top
Mountain
Knob
Mill
Creek
Hollow
Mountain
Creek
Turkey
Knob
Branch
Spring
Branch
Blue
Vest
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


2 000 000 FEET
635 000 FEET
T. 16 N.
T. 17 N.
R. 9 W.
R. 8 W.
(Joins sheet 47)
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 55)
625 000 FEET
2 035 000 FEET
N
Hunters Mountain
Knob Creek
Mill Cr
Big Hurricane Creek
Little Hurricane Creek
Jumbo
MELBOURNE
(county seat)
water
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


N
(Joins sheet 48)
R. 8 W.
R. 7 W.
2,070,000 FEET
(Joins sheet 51)
(Joins sheet 53)
T. 17 N.
T. 16 N.
625,000 FEET
635,000 FEET
(Joins sheet 56)
2,040,000 FEET
Zion
Bone Town
Sage
Walkins Branch
Huley Creek
Caney Creek
Finley Creek
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


2 075 000 FEET
R. 7 W.
(Joins sheet 49)
635 000 FEET
T. 17 N.
T. 16 N.
(Joins sheet 52)
Caney Creek
Piney Fork
Finley Creek
Piney Fork
Hamms Schoolhouse Branch
Mudloam Branch
Mays Branch
SHARP COUNTY
625 000 FEET
2 090 000 FEET
(Joins sheet 57)
(Joins inset, sheet 30)
2 150 000 FEET
R. 5 W.
755 000 FEET
(Joins sheet 15)
Little Gut
Wilson Hollow
Conner Hollow
Gut Creek
Watered Fork Creek
Onion Hollow
Big Hollow
Prairie Hollow
T. 20 N.
SHARP COUNTY
745 000 FEET
(Joins inset, sheet 49)
2 160 000 FEET
Woodland Hills
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000
N

N

R. 10 W. | R. 9 W.

2 000 000 FEET

(Joins sheet 50)

610 000 FEET

T. 16 N.

(Joins sheet 55)

610 000 FEET

1 965 000 FEET

(Joins sheet 58)

Boswell

West Spring Br.

Huff Spring Creek

WHITE RIVER

STONE COUNTY

Bone Island

PACIFIC

MISSOURI

Creek

Widemun Creek

Panther Knob

Sycamore Creek

Ruthie Mountain

Harvey Hodge Mountain

Devils Gap

Devils Knob

Devils Backbone

Thompson Mountain

Creek

Mount Olive

Pelham

19 20 21 22 23 24 19

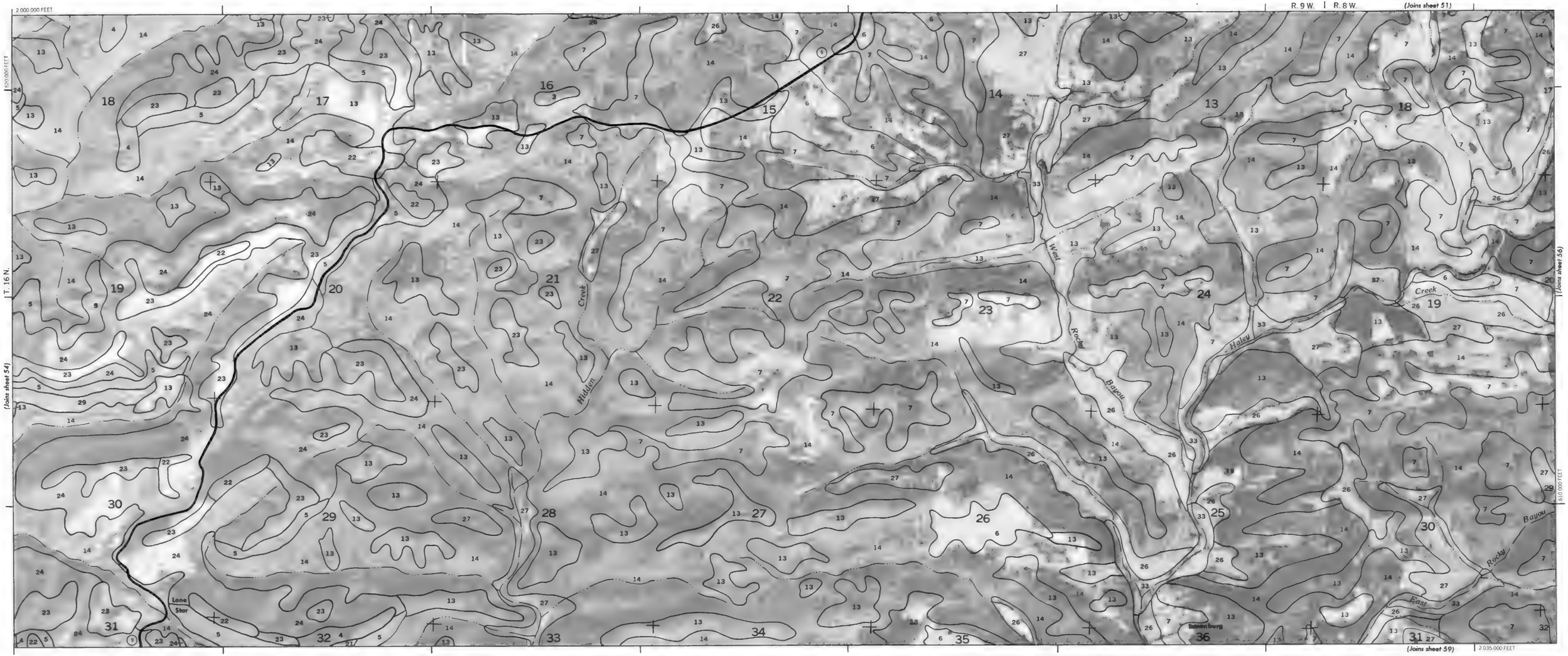
30 29 28 27 26 25 30

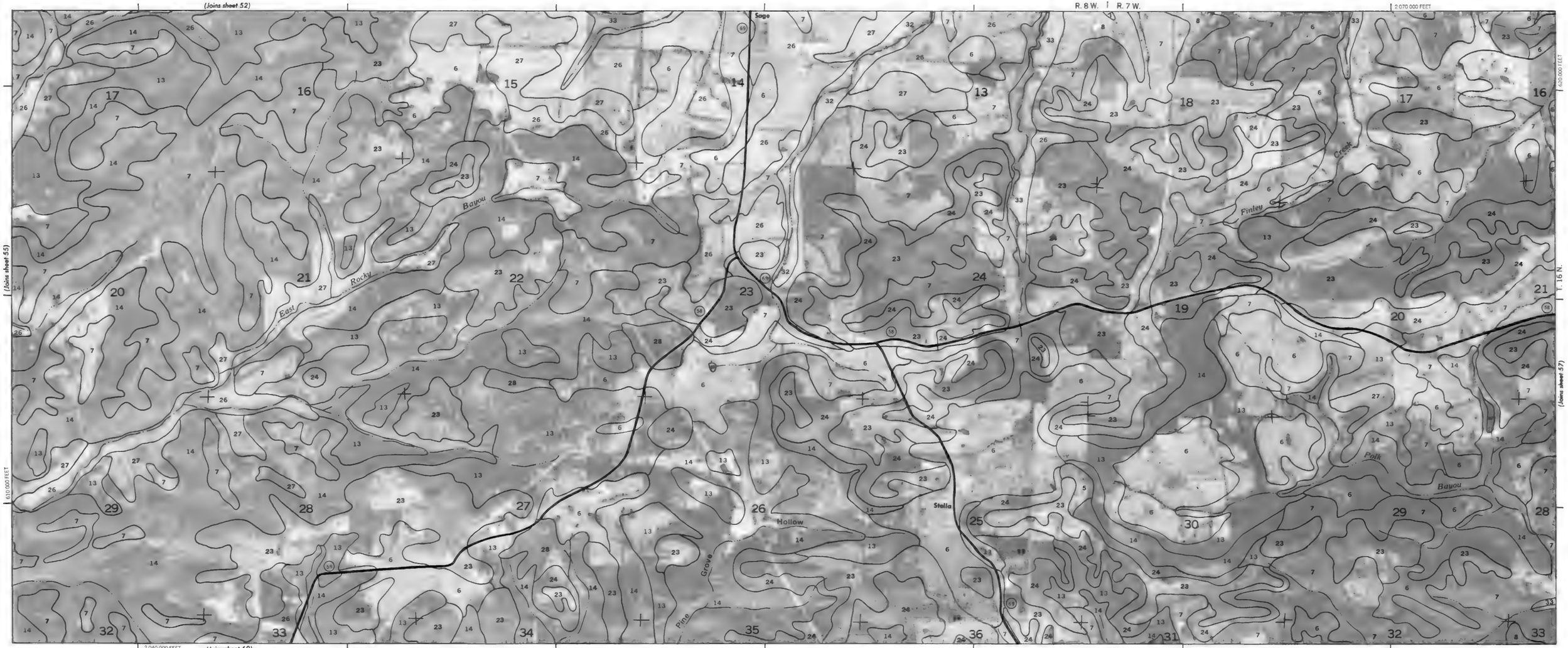
31 32 33 34 35 36 31

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

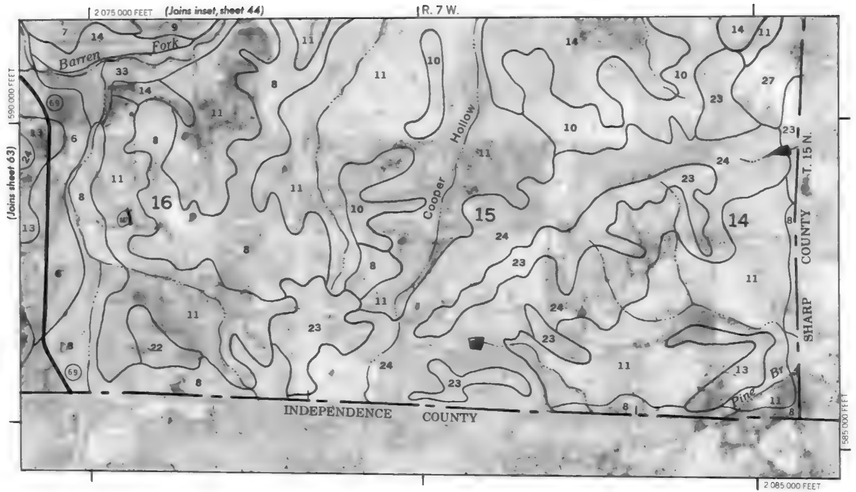
1 .5 0 1 Kilometer

Scale - 1:20000


2 000 000 FEET
R. 9 W.
R. 8 W.
(Joins sheet 51)
T. 16 N.
(Joins sheet 54)
(Joins sheet 56)
610 000 FEET
2 035 000 FEET
(Joins sheet 59)
Hidden Creek
West Rocky Bayou
Haley Creek
Rocky Bayou East
Lone Star
Salem
5000 4000 3000 2000 1000 0 5000 Feet
0 1 Kilometer
Scale - 1:20000


N
(Joins sheet 52)
R. 8 W.
R. 7 W.
2 070 000 FEET
620 000 FEET
T. 16 N.
(Joins sheet 55)
(Joins sheet 57)
610 000 FEET
2 040 000 FEET
(Joins sheet 60)
Sage
Bayou
Rocky
East
Finley
Creek
Polk
Bayou
Stella
Hollow
Grove
Pine
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

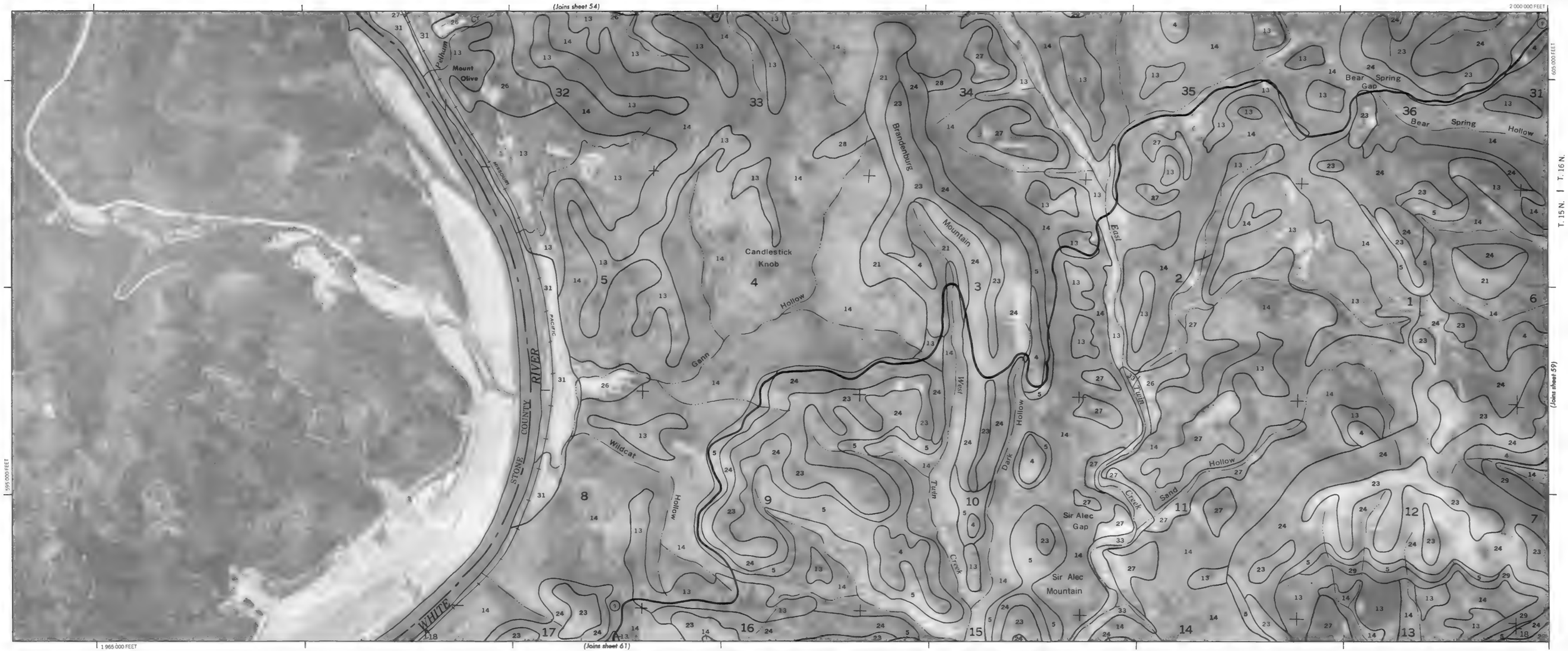
N

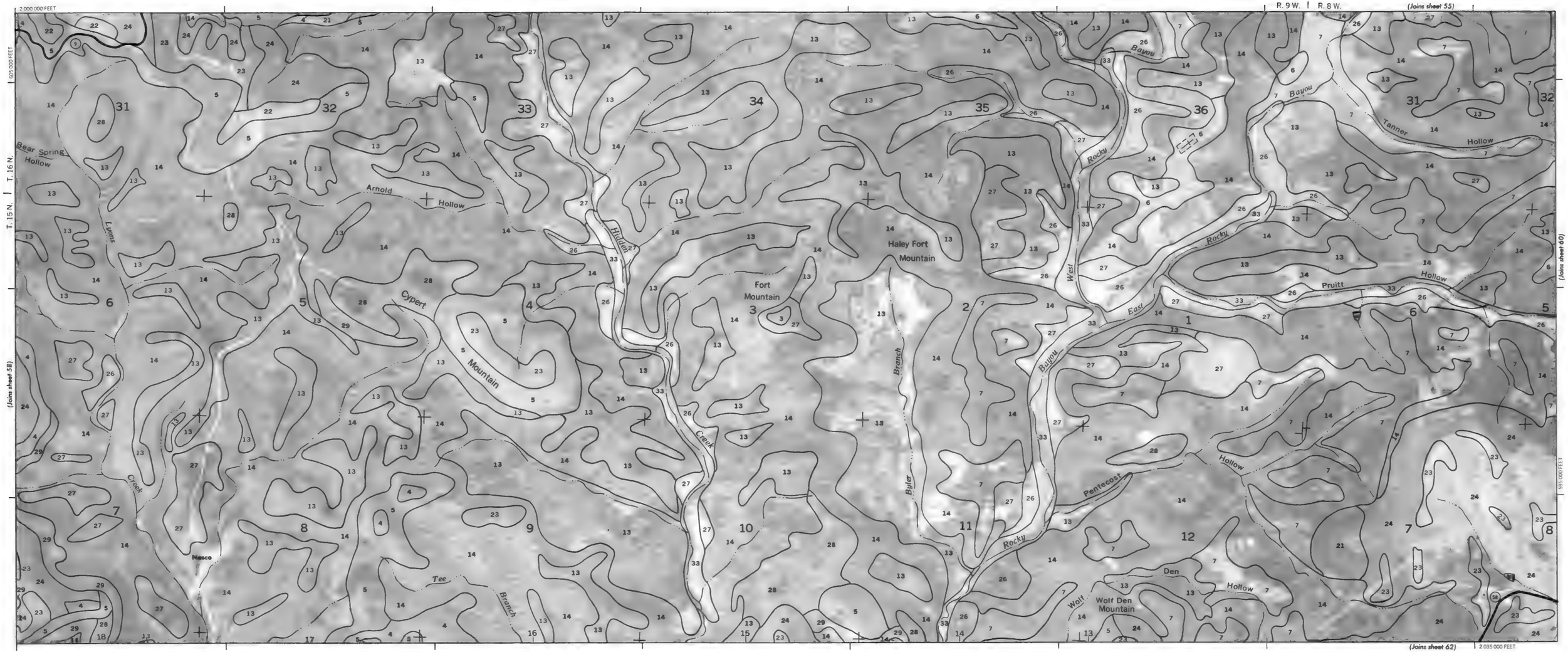


5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

Scale - 1:20000

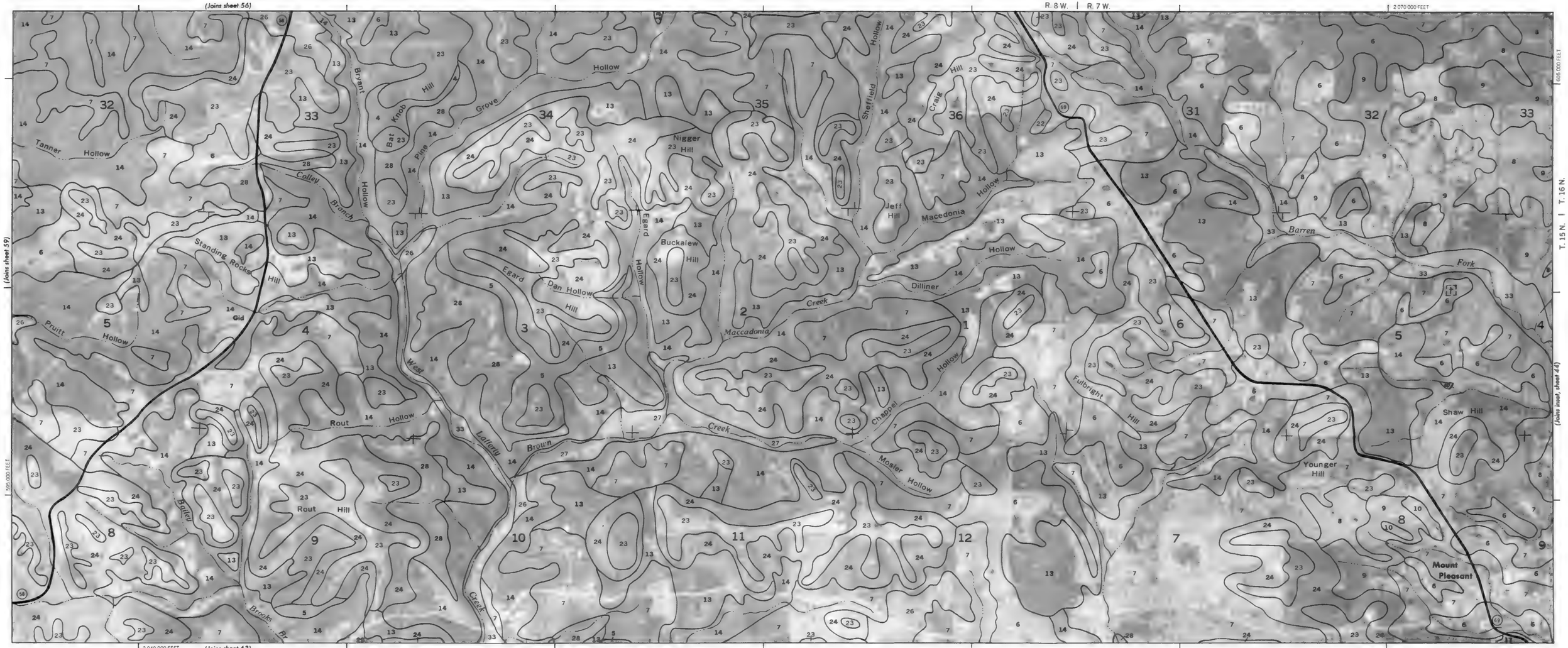

N
R. 10 W. | R. 9 W.
2 000 000 FEET
(Joins sheet 54)
605 000 FEET
T. 15 N. | T. 16 N.
(Joins sheet 59)
595 000 FEET
1 965 000 FEET
(Joins sheet 61)
Fulton
Mount Olive
Missouri Pacific
STONE COUNTY
RIVER
WHITE
Brandenburg Mountain
Candlestick Knob
Hollow
Gann
Wildcat
Hollow
West Turin Creek
Dark Hollow
Sir Alec Gap
Sir Alec Mountain
East Turin Creek
Sand Hollow
Bear Spring Gap
Bear Spring Hollow
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

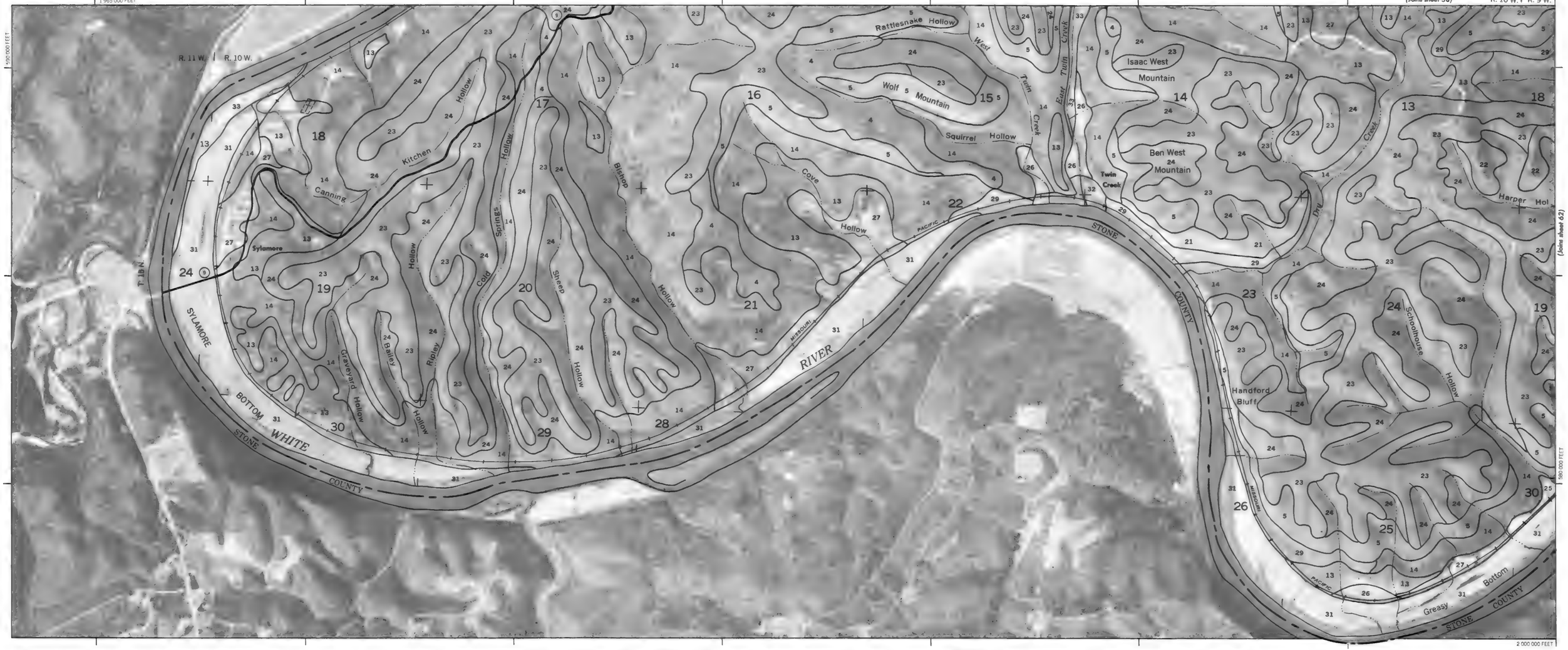


5000 4000 3000 2000 1000 0 5000 Feet

1 .5 0 1 Kilometer

Scale - 1:20000


N
(Joins sheet 56)
R. 8 W.
R. 7 W.
2 070 000 FEET
605 000 FEET
T. 15 N.
T. 16 N.
(Joins sheet 59)
595 000 FEET
(Joins inset, sheet 44)
2 040 000 FEET
(Joins sheet 63)
Tanner Hollow
Colley Branch
Bryant Hollow
Bat Knob Hill
Grove Pine Hill
Nigger Hill
Sheffield Hollow
Craig Hill
Jeff Hill
Macedonia Hollow
Standing Rock Hill
Egard Hollow
Buckalew Hill
Egard Dan Hollow Hill
Dilliner Creek
Maccadonia Creek
Pruitt Hollow
Gid
West Hollow
Rout Hollow
Rout Hill
Lafferty Brown Creek
Chapel Hollow
Master Hollow
Fulbright Hill
Barren Fork
Shaw Hill
Younger Hill
Mount Pleasant
Butler Creek
Brooks Br
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


1 965 000 FEET
590 000 FEET
R. 11 W.
R. 10 W.
(Joins sheet 58)
R. 10 W.
R. 9 W.
(Joins sheet 62)
580 000 FEET
2 000 000 FEET
N
T. 18 N.
Rattlesnake Hollow
West Tuffy Creek
East Tuffy Creek
Isaac West Mountain
Wolf Mountain
Squirrel Hollow
Ben West Mountain
Twin Creek
Harper Hol
Kitchen Hollow
Canning Hollow
Sycamore
Cold Springs Hollow
Sheep Hollow
Bishop Hollow
Cove Hollow
Graveyard Hollow
Bailey Hollow
Ripley Hollow
Schoolhouse Hollow
Handford Bluff
Greasy Bottom
SYCAMORE BOTTOM
STONE COUNTY
WHITE RIVER
MISSOURI PACIFIC
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


N
(Joins sheet 59)
R. 9 W. I R. 8 W.
2 035 000 FEET
590 000 FEET
T. 15 N.
(Joins sheet 61)
(Joins sheet 63)
(Joins sheet 64)
2 000 000 FEET
580 000 FEET
Meeks Mountain
Wolf Den Mountain
Wolf Den Hollow
Sam Lee Hollow
Harper Hollow
Lyons Creek
Rock Creek
Castle Hollow
Tee Branch
Hidden Creek
Bayou Halsey
Rocky Creek
Mike Hollow
Helm Hollow
George Hollow
Campbell Hollow
Wilson Creek
Greasy Bottom
MISSOURI PACIFIC
RIVER
STONE COUNTY
WHITE
Guion
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 63

N

2 040 000 FEET

590 000 FEET

T. 15 N.

(Joins sheet 62)

R. 8 W. | R. 7 W.

(Joins sheet 60)

(Joins inset, sheet 57)

580 000 FEET

(Joins sheet 65)

2 070 000 FEET

Pine Mountain

Bettey Brooks Branch

West Lafferty Creek

Lafferty Creek East

Stillhouse Hollow

INDEPENDENCE COUNTY

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

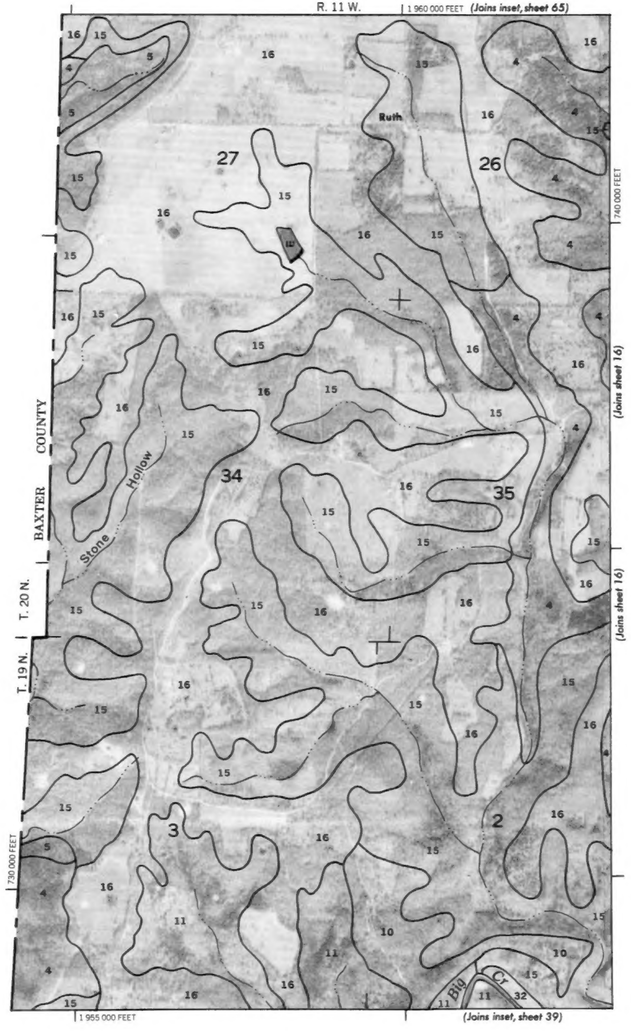
1 .5 0 1 Kilometer

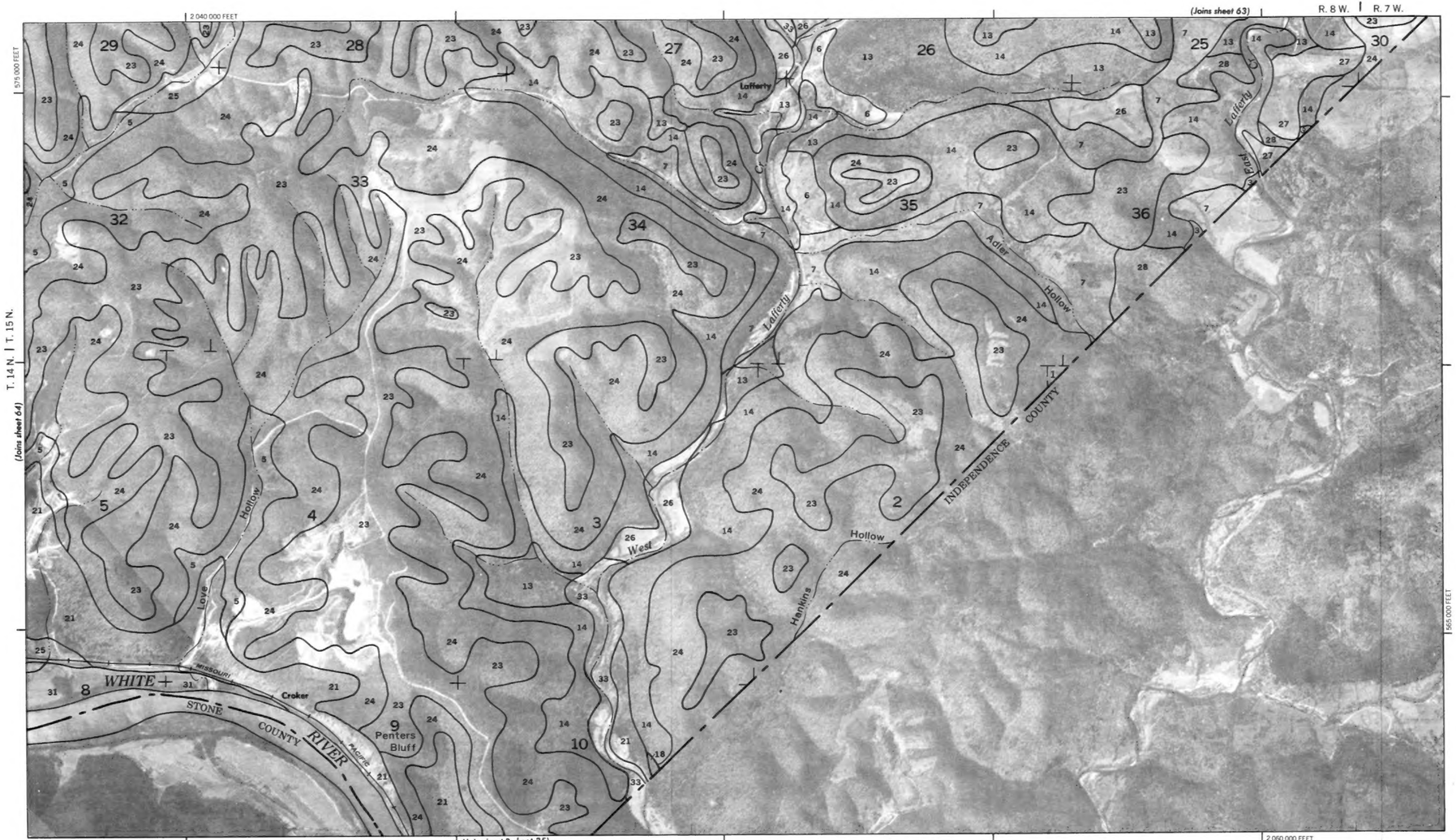
Scale - 1:20000

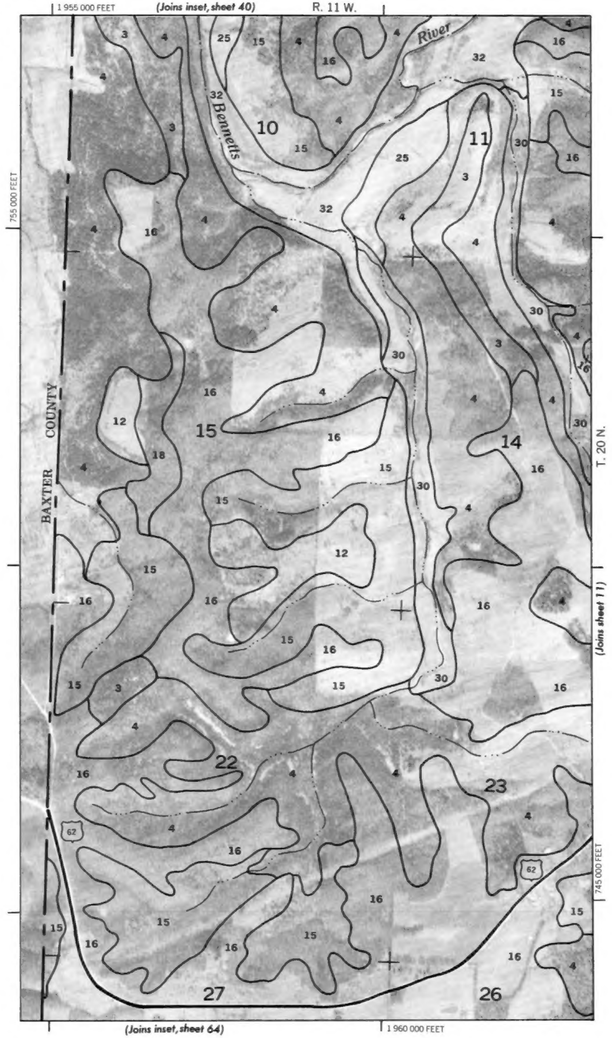
64

N

FULTON AND IZARD COUNTIES, ARKANSAS — SHEET NUMBER 64




2 040 000 FEET
(Joins sheet 63)
R. 8 W.
R. 7 W.
575 000 FEET
T. 14 N.
T. 15 N.
(Joins sheet 64)
565 000 FEET
2 060 000 FEET
(Joins inset 8, sheet 35)
Lafferty
Adler
Hollow
INDEPENDENCE COUNTY
Love
West
Hankins
WHITE
MISSOURI
Croker
STONE COUNTY
RIVER
Penters Bluff
Pacific
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000


1 955 000 FEET
(Joins inset, sheet 40)
R. 11 W.
River
Bennetts
BAXTER COUNTY
T. 20 N.
(Joins sheet 11)
755 000 FEET
745 000 FEET
1 960 000 FEET
(Joins inset, sheet 64)